THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIV. No. 597.] LONDON, OCTOBER 20, 1874. [26TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 28-candle gas; 12¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
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(Mixed ready for use).
FOUR PRIZE MEDALS.
WORKS: BRIXHAM, TORBAY.
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
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SPECIALITIES IN WOOD
FOR
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WELL-SEASONED PLANKS.
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103, ICKNIELD STREET EAST,
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COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Coal Office,
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THE OLD TUBE-WORKS, WEDNESBURY;
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THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
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J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Steaks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
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GAS ENGINEERS AND COAL FACTORS,
OF
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CONTRACT FOR SUPPLYING ANY QUANTITY OF
GAS, HOUSE, and STEAM COAL, and CANNEL;
Also for every sort of Gas Apparatus and Fire Goods.
MESSRS. ROMANS, being lessees of several Gas-Works, have their Cannels tested in the ordinary working process, thus securing for their customers a guarantee beyond mere laboratory experiments.
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PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
For the English Government, and for the Government of the Netherlands;
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Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.;
236, GEORGE STREET, GLASGOW; AND 15, MARKET STREET, MANCHESTER.
G. G. and Co. have just received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

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MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

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LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

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N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

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PATENT IMPROVED SEAL

FOR

GAS HYDRAULIC MAINS.

SAVES COAL, RETORTS, FUEL, LABOUR, TIME, SPACE, AND CAPITAL.

PREVENTS STOPPAGE OF ASCENSION-PIPES, DEPOSITION OF CARBON IN RETORTS, THICKENING OF TAR IN HYDRAULIC MAIN.

GIVES MORE GAS PER TON OF COAL, WITH HIGHER ILLUMINATING POWER, SATISFACTION, AND PROFIT TO SHAREHOLDERS AND MANAGERS.

IS STRONG, SIMPLE, EASILY FIXED AND WORKED, AND THOROUGHLY EFFICIENT AT ALL TIMES.

TESTIMONIAL.

Gas-Works, Guildford, Sept. 15, 1874.

GENTLEMEN,—The five retorts fitted with your Patent Moveable Seal for Dip-Pipes, on June 30, have been in constant use since that date, and have worked in a most satisfactory manner.

These Retorts are still quite clean and free from carbon, whilst others not so fitted, after being at work eight weeks, required scurfing, having a deposit of carbon 2 inches in thickness on the inside.

I also find a slight increase in the yield of gas per ton of coal carbonized, although your Patent Seals are fitted to but one-fifth of the Retorts now at work.

As your statements respecting your apparatus are fully confirmed by the results obtained in practical working, I should wish you at once to fix one to each of the ovens at these works, that I may obtain all possible advantage during the coming winter.

Yours truly,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street, E.C. JOS. SHAW, Manager.

MODELS MAY BE SEEN, AND INFORMATION OBTAINED, AT THE OFFICES, 28, GRACECHURCH STREET.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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GAS-FITTERS TOOLS, VALVES, COCKS, &c.

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TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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FOR GAS, STEAM, AND WATER;

Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

CORE BARS FOR IRONFOUNDERS, STOCKS, TAPS, AND DIES, IRON COCKS, &c.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

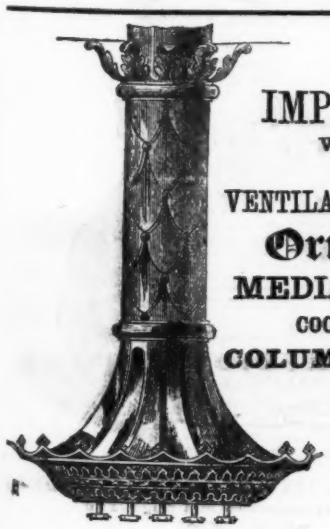
(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.



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IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

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Drawings and Prices upon application.

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J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.

WILLIAM FRASER,

INVERKEITHING,

(Owner of the Works at which Fire-Clay Retorts were first made), can supply

RETORTS, FIRE-BRICKS, &c.,

to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

He ships at Charlestown his CELEBRATED HALBEATH STEAM COALS, on Navy List.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

TO GAS COMPANIES AND THE TRADE.

J. DEFRIES & SONS,

MANUFACTURERS OF

CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.

A LARGE STOCK ALWAYS IN HAND OF

IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,

AND EVERY DESCRIPTION OF

GAS AND WATER FITTINGS.

THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.

STREET LAMPS AND COLUMNS IN GREAT VARIETY.

WORKS: LONDON AND BIRMINGHAM.

GAS MOONS, Cut and Engraved, of the newest designs;

GAS REFLECTORS In Silver and Glass;

GAS NIBS AND BURNERS Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.

ESTABLISHED 1830.

THE

LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON STREET, OLDHAM.

HENRY THOMAS, Managing Director.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

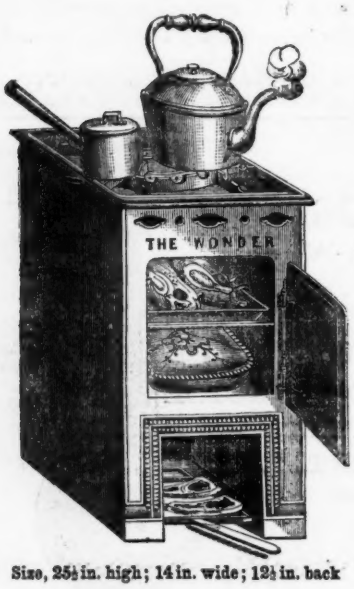
COPY OF LETTER RECEIVED FROM MAGNUS OHREN, ESQ.

Crystal Palace District Gas Company, Lower Sydenham, S.E.

To Messrs. John Wright and Co., Essex Works, Birmingham.

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.



Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.

No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,

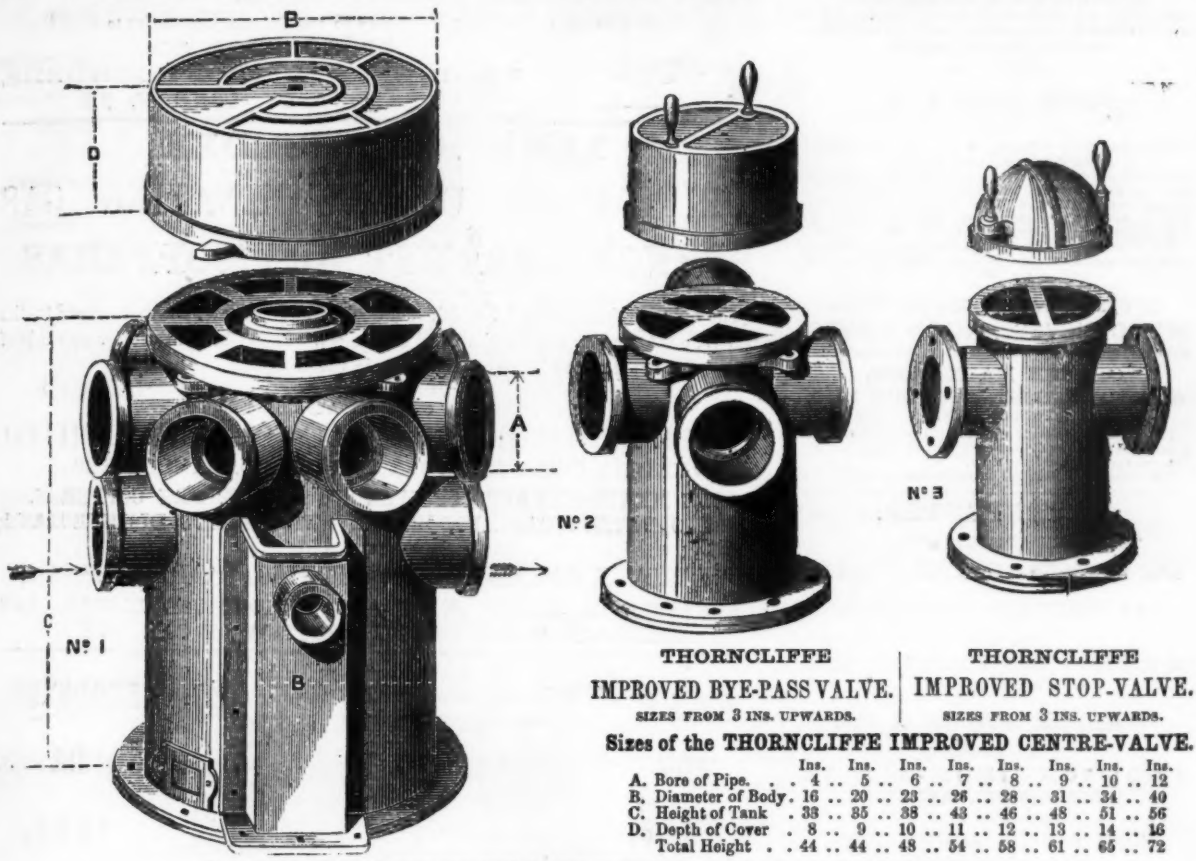
Has all the appearance of a Bright Fire.

PRICE from 32s.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

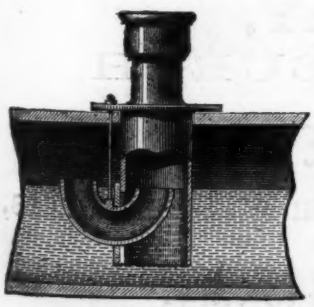
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



Dip-Pipe, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

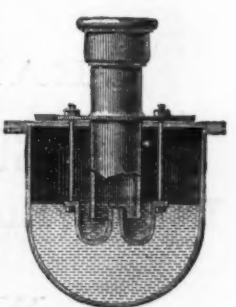
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



Dip-Pipe, No. 2.

FOR PRICES, TESTIMONIALS, &c., APPLY TO

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

OXIDE OF IRON.—We are prepared to supply, on moderate terms,

HYDRATED PEROXIDE OF IRON (BOG OCHRE),

Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.

FRANCIS RITCHIE & SONS,
BELFAST.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20 & 22, WHARF ROAD
CITY ROAD, LONDON, N.,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.

N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

TO GAS COMPANIES, ENGINEERS, &c.

WOOD SIEVES.—WOOD SIEVES.

Estimates given and Contracts taken by the Manufacturer

GEORGE MACKANESS,
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These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.

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THE ORIGINAL MANUFACTURER OF
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.

WORKS:
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ARDWICK IRON-WORKS,
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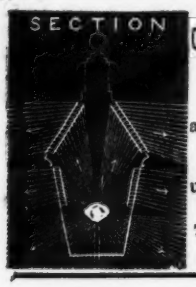
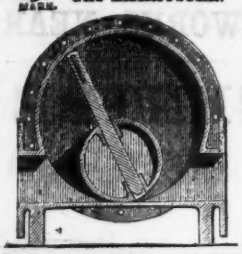
MANUFACTURERS OF
IRON TANKS, GASHOLDERS,
GAS APPARATUS,
PIPES, VALVES, IRON ROOFS,
WROUGHT AND CAST IRON GIRDERS.

DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.



THE PATENT
CATOPTRIC LAMP
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

TRADE MARK
J. BEALE'S
PATENT
GAS EXHAUSTER.



BEALE'S CONTINUOUSLY ACTING
GAS EXHAUSTERS
ARE NOW MANUFACTURED BY
B. DONKIN & CO.

MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.

B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

Estimates and Prices on application to
B. DONKIN & CO.,
ENGINEERS & IRONFOUNDERS,
BERMONDSEY, LONDON, S.E.

LIME SUPERSEDED
IN THE
PURIFICATION OF ILLUMINATING GAS
BY
SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

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PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

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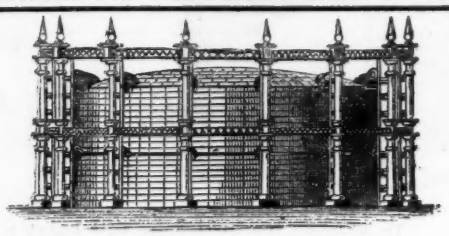

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SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

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OVER 10,000 IN USE.

NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

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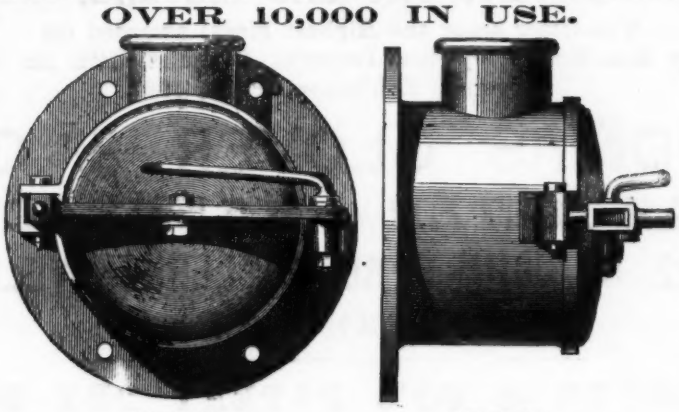

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" Gaslight Company, Bow Common.	" Imperial Gaslight Company.	" Rochdale Corporation Gas-Works.	" Merthyr Tydfl. Gas-Works.
" London Gaslight Company.	" Gas-Works, Arsenal, Woolwich.	" Liverpool United Gas-Works.	" Ystrad Gas-Works.
" Independent Gaslight Company.	" Commercial Gas Company.	" Birkenhead Gas-Works.	" St. Alban's Gas-Works.
" Phœnix Gaslight Company.	" Alliance and Dublin Gas-Works.	" Birmingham Gas-Works.	" Over Darwen Gas-Works.
" South Metropolitan Gaslight Co.	" Edinburgh Gas-Works.	" Nottingham Gas-Works.	" Aylesbury Gas-Works.
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The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

The following important Testimonial has been given:—

THE GASLIGHT AND COKE COMPANY

(Commonly called the Chartered Gas Company),

BECKTON, NORTH WOOLWICH, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,

(Signed) G. C. TREWBY.

P.S.—We shall have very shortly about 3000 of your Lids in use.

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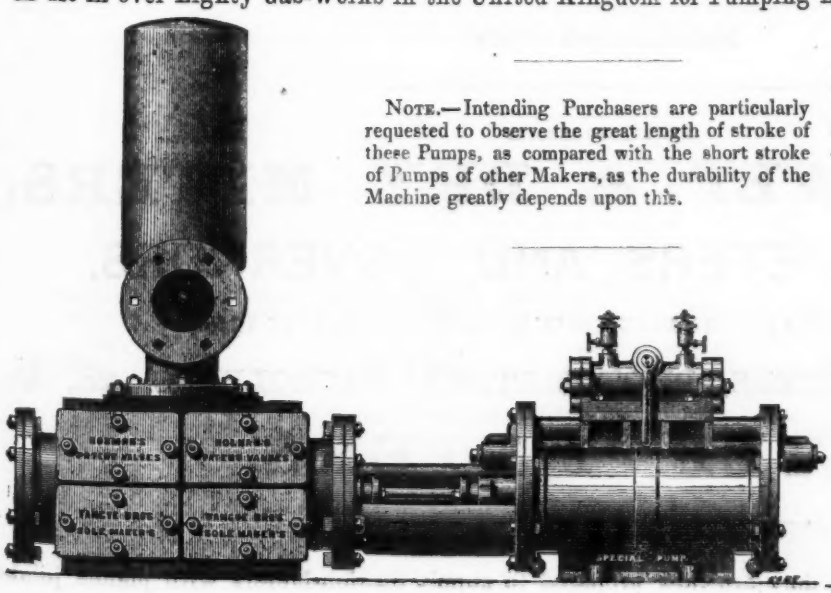
OF

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

Nearly 4000 have been sold since their introduction in 1867.

In use in over Eighty Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.



NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The following are a few of the leading Sizes:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons per Hour, Approximate.	Price.
3	1½	9	550	£16
4	2	9	970	18
3	3	9	2,200	18
4	3	12	2,200	20
6	3	12	2,200	25
4	4	12	3,900	25
6	4	12	3,900	30
6	5	12	6,100	35
7	5	12	6,100	40
8	5	12	6,100	45
6	6	12	8,800	40
8	6	12	8,800	50
7	7	12	11,900	50
10	7	12	11,900	65
8	8	18	15,660	65
10	8	18	15,660	75
10	9	24	19,800	90
12	9	24	19,800	110
10	10	24	24,400	100
14	10	24	24,400	140
12	12	24	35,240	140
21	12	36	35,240	285
14	14	24	47,960	180
26	14	48	47,960	450

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

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PATENT WET & DRY METERS,

STATION-METERS AND GOVERNORS,

PRESSURE REGISTERS, GAUGES,

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WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

CONTENTS.

	PAGE
Circular to Gas Companies:—	
The Gas Companies and the Metropolitan Authorities	533
The proposed Municipal Constitution of London	533
Sir Charles Adderley on the Functions of the State	533
A proposed Sliding Scale of Dividend	533
The Manufacture of Gas at Kilmarnock	534
Proposed Exhibition of Gas-Fittings in London	534
Price of Gas in the United States	534
New Gas Manager for Sheffield	534
Gas Affairs at Pontypool	534
Gas Affairs at Pontefract	534
Average Meter System at Idle	534
Water and Sanitary Notes:—	
Slough in Despondency	534
The Sheffield Opposition to the Wakefield Water Company	534
Water Supply at Morpeth	535
Water Supply at Carlisle	535
Water Supply at Hexham	535
Water Supply at Bourton-on-the-Water	535
Leading Article:—	
A Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas	535
Correspondence:—	
Proposal for a Sliding Scale of Dividend	537
Pelouze and Audouin's last Patent	537
Retort Settings	538
Relative Price of Commercial and Chartered Gas	538
Legal Intelligence:—	
The Railway Commission—Nitshill and Lesmahagow Coal Company *v.* Caledonian Railway Company	538
Mansion House Police Court—Eupion Gas Company's Shares	539
Miscellaneous News:—	
Lancashire Gas-Meter Company, Limited	537
Metropolis Gas Supply	539
Meeting of the London Gaslight Company	540
Meeting of the Sheffield Water-Works Company	542
Reductions in the Price of Gas	542
Newcastle and Gateshead Gas Company	542
Sunday Labour in Gas-Works. By Theobald Forstall	542
Kilmarnock Corporation Gas-Works	543
Propagation of Pressure and Flow of Water in Long Tubes	543
American Water Gas Researches. By Professors Würtz and Silliman	544
Schemes of Sewerage	545
Price of Gas in America	545
Fatal Gas Explosion at Bristol	545
The Sewage of Towns. By Baldwin Latham, C.E	546
Sewage—Its Use and Abuse. By Charles F. Jones	547
Bradford Gas and Water Supply	548
Iron and Coal Trades of South Staffordshire and East Worcestershire	548
Iron and Coal Trades of Lancashire	548
Coal and General Trade of the North	548
Metropolis Water Supply—Court of Common Council	549
Cardiff Gas Company	549
Death of the Manager of the Pontypridd Gas-Works	549
Northampton Gaslight Company	549
Death of Mr. Orlando Brothers	549
Birmingham Public Lighting	549
Richmond Drainage and Water Supply	549
Rotherham Public Lighting	549
Brechin New Water Supply	549
Fatal Accident at the Chesterfield Gas-Works	549
Execution against the Dublin Corporation	549
Gas Explosion in a Railway Train	549
Bedlington Water Supply	549
Register of New Patents:—	
Henry, W.—Lighting and Heating	549
Yarrow, E. H.—Manufacture of Gas	549
M'Beath, C.—Retorts, &c.	549
Abel, C. D.—Gas Motor Engines	550
Siebert, O.—Gaslight Apparatus	550
Leoni, S.—Heating and Cooking Apparatus	550
Holland, H.—Manufacture of Gas	550
Applications for Letters Patent	550
Grants of Provisional Protection	550
Invention protected for Six Months	550
Notices to Proceed	550
Patents which have passed the Great Seal	550
Patents which have become void	550
Notes and Queries	551

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 20, 1874.

Circular to Gas Companies.

The position taken up by the metropolitan gas companies, in view of the proceedings contemplated by the Corporation of London and the Metropolitan Board of Works in the coming session of Parliament, is clearly revealed in the reports of the half-yearly meetings we have recently had occasion to publish. The attitude assumed is that of defence, not defiance. Standing most determinedly on their rights, as conferred and guaranteed by Parliament, they are ready and willing to undergo the ordeal of another investigation before a committee. They have nothing to fear in the way of exposure; all their doings are public now. But while thus standing on their defence, they offer the assurance—needless to our minds—that the grievance of which the consumer complains will be remedied on true commercial principles, *i.e.*, that the price of gas will be reduced as the cost of production is diminished. At the same time it is openly announced that if there be a local authority ready to take the works and willing to pay a fair price for them, "in God's name let the Corporation have them," and do the best they can. It is with a feeling nearly akin to malice that we join in the wish that the metropolitan authorities would absorb the gas companies or enter into competition with them. In the case of the Corporation of the City of London, the result may be considered as perfectly certain. A body who cannot make two such *unique* and unprecedented concerns as the Cattle and Meat Markets remunerative, may be safely trusted to make a mess of the management of a complicated business like that of a gas undertaking. The Metropolitan Board of Works never had, and never will have, the opportunity of trying their hands at anything like the management of a commercial undertaking, and, therefore, we have no occasion to conjecture what would happen in their case if they started or became possessed of gas-works. All we know is that their establishment at present is by no means cheap, and we have no reason to believe that their management of gas-works would be other than extravagant. The example of Manchester is constantly appealed to; but it is forgotten—or rather is not known—that the Manchester Corporation Gas-Works are not things of yesterday, and that they were at one time not very profitable, while the management was extremely unsatisfactory to the citizens. If that happened, as we shall presently show it did, in days when the manufacture and distribution of gas was a simple business, what may be expected to happen now with the Corporation or Board of Works, when nobody knows from day to day what the price of coal and iron mains may be, or what wages may run to? We have repeatedly expressed our belief that a return to the former price of coal is impossible, and we reiterate the opinion. We believe that cheap gas—that is, gas much under 4s. per 1000 feet—will never again be known in this metropolis, in whosesoever hands the supply may be vested.

The municipal constitution of London, with which we may candidly admit the future of the gas companies is intimately bound up, is so important that we need no excuse for devoting a short space to a consideration of what is desirable in constructing, and to some extent reconstructing, the arrangements. We have not yet been able to procure a copy of the bill which is to be introduced next session, but we gather with satisfaction that the desire of the promoters is to constitute one municipality—not ten—as was once proposed. The idea of ten "*federated*" corporations, nine of which would be subordinate to the City of London, is happily discarded, and the notion now is to provide for one "harmonious and efficient whole." This is well, for let us imagine a Corporation of Marylebone, and anticipate the aldermen who would be elected, and contrast them, in fancy, with the aldermen actually elected in the City of London; and then go a step farther, and, on a great occasion, conceive a Mayor of Marylebone subordinate to the *Lord* Mayor of the City of London! But we need not waste time in dreaming; all we shall do here is to point out to the promoters of this Corporation Bill that two things are absolutely necessary—one is the reduction of the number of common councilmen for what is known as the City of London; and the other is that the election of aldermen must not be for life, nor the succession to the mayoralty a matter of course.

We do not commonly pay much attention to the extra-parliamentary utterances of politicians. They are sometimes very important, but oftener must be regarded as dust thrown in the eyes of gaping multitudes. For this reason, we do not regard with importance the recent speech of the President of the Board of Trade, at the conclusion of which he is reported to have said that he would not favour the interference of Government with private enterprise. It may be supposed that particular reference was here made to the suggested acquisition of the railways by the State; but, whatever arguments apply to the national proprietorship of railways, will equally apply to corporate ownership of gas and water undertakings. Speaking for ourselves, we may say that we have no objection to the principles involved in carrying out the ideas of the Mayor of Birmingham, and as regards land, the absorption of railways by the State, and gas and water undertakings by local authorities. All we object to is the application of essentially communistic theories on a limited scale, and at the expense of gas and water companies.

We publish in another column a communication from an estimable gentleman well known in the gas world, which is fathered putatively by Mr. Livesey, on the question of a sliding scale of dividend. We shall be heartily glad to have the matter discussed as our correspondent wishes, but we have no hesitation in saying at once that we are not quite in agreement with the writer. His "normal" case of a company with a rental of £30, to a capital of £100, who are to be allowed 10 per cent. dividend, is all very well, but we do not see why a company struggling in a widely spread and sparsely populated district, who are so unfortunate as to have only a rental of £30 to a capital of £110 should be condemned to a 9 per cent. dividend. Our correspondent would give an advantage to companies with densely populated and limited areas, to which we have no objection, but we should prefer

to see all put upon the same basis. The simplest plan would be to regulate dividend according to price, as was originally suggested, but even this might involve a gross unfairness. No two existing companies, it is more than probable, have their being under exactly comparable circumstances, and what might be perfectly fair to one might be gross injustice to another. Taking all things into consideration, however, we are inclined to believe that price alone should regulate dividend; in other words, that those who can supply cheapest should be allowed to make the largest profit. That is a principle well understood in commerce; but it must be remembered that commercial principles are not to be strictly applied to undertakings limited in their areas and restricted from competition.

The report of the Gas Committee of Kilmarnock, which we publish to-day, contains some very instructive information. The comparative statement of the cost of production of gas for fourteen years is of wide interest in some particulars. There is first of all a record of the steadily increasing *cost* of cannel coal, and what strikes us as most remarkable, the decreasing *value* of cannel. Coal which, at an average cost of 14s. 10d., produced say 9000 feet of gas, now, at a cost of 28s. 6d., produces only 7600 feet. Seeing the able management under which the Kilmarnock works are carried on, we are bound to regard this as an indication of a decided decrease in the gas-producing value of the cannel now raised, of which we have other proofs. The next point illustrated in this statement is the rise in wages, not limited to Scotland. Within the period a comparable rise has taken place all over the kingdom. At the same time it will be seen that, so far as "salaries and charges" are concerned, a notable diminution has taken place, and this we may remark has happened with every well-managed and *progressive* company. It is well shown in a comparison of the metropolitan gas companies accounts within the period 1861–1873, *teste* Mr. Samuel Hughes and Mr. Field, with whose calculations we shall not for the moment further trouble ourselves. On the whole, and as regards *working expenses*, this comparative statement represents the experience of every well-managed undertaking within the period embraced in the return.

The amalgamation of all the metropolitan gas companies, which we do not conceal our wish to see effected, would render possible in London the establishment of such an exhibition as that of the Paris Gas Company, lately described by our correspondent. We believe the consumption of gas in London might be largely increased if people were made better acquainted with its economy. In Paris, costing 6s. 9d. per 1000 feet, and only about 12½-candle power, the gas consumed last year per head of population nearly equalled the consumption per head in London, where the average price may be said to be only 4s. per 1000 feet.* The Parisian tradesmen and citizens are, we believe, much more thrifty in their habits than their London compeers, and they seem to be learning that gas is cheap as fuel, and that is the lesson we wish to see the Londoner taught. Private enterprise is doing a good deal in the way of such teaching. There are plenty of shops in London where gas cooking and heating apparatus are exhibited and sold. Still we cannot help thinking that a permanent exhibition, such as that started by the Paris Company, would have great interest here, and would largely increase the consumption of gas. It might be maintained at small expense by the associated companies, and would soon pay the cost of maintenance. We throw out the hint here, in the hope that the matter may receive some consideration at the hands of our directors.

We have read and been told that some American cities are the best lighted in the world, and to-day we publish a return showing the average price of gas in the several States of the Union, and the actual cost in some of the chief cities. The average net price, it will be seen, is above 17s. 3½d. per 1000 feet, and it is worthy of remark that New York has borne the infliction of an increase amounting to nearly 4s. 6d. without much grumbling. We do not wish to conceal the fact that there is some dissatisfaction with the gas companies in New York, and that there, as here, it is recommended that the municipality shall take possession. The transfer should have taken place earlier. We are astonished that so shrewd a man as Mr. Tweed should have let slip the opportunities he would have had if the New York Gas-Works had been the property of the Corporation.

A short paragraph in our last issue informed our readers of the results of the past half year's working of the Sheffield United Company, and there is little more to notice in the report of the directors. We observe that Mr. Herbert Unwin has resigned his appointment as engineer to the company, and we may congratulate the directors on having secured the services of Mr. Young, late of the British Company, Hull. If gas can be made and supplied at a cheap rate in Sheffield, Mr. Young is the man who can do it; and we shall now hope to see an end to the long feud between the gas company and the Corporation.

Speaking of Sheffield reminds us to mention that we have received from a correspondent an account of the genesis of the Municipal Corporations (Borough Funds) Act, which our readers well know was particularly designed to relieve the members of the Corporation of Sheffield from the payment of costs illegally incurred. The communication, as it stands, is not adapted for publication in our columns; but the story of the Act told impersonally would have much interest.

A dispute between the Pontypool Local Board and the gas company resulted in the town being left in darkness for some nights. In the end, the town was canvassed by a couple of gentlemen, and it was discovered that, with two exceptions, the townsfolk were unanimous in favour of agreeing with the company's terms. Thereupon the Local Board gave way, and Pontypool once more enjoys the blessing of gaslight.

The Town Council of Pontefract are going to Parliament next year for an extension of their boundary, and it was proposed to insert in the Bill a clause authorizing the purchase of the gas company. This clause has, however, by a resolution of the council, been withdrawn. The question in Pontefract now is the institution of a competing company, with regard to which the Town Council will find themselves in some difficulties.

The Airedale Gas Company have just announced to the Idle Local Board their willingness to supply the public lamps on the average meter system, and their absolute refusal to continue the supply on the "lump sum" plan, and the Board have agreed to accept the terms of the company if they will allow a discount of 10 per cent.—only 5 per cent. deduction being made to private consumers.

We expect to hear shortly of further extensions of the average meter system in this metropolis.

The Woolwich Consumers Gas Company have spontaneously offered to reduce the charge for public lamps 5s. per annum, and the Plumstead Vestry have decided on applying to the Eltham and Phœnix Companies for a corresponding reduction.

* The numbers are: Paris, 2800 feet per head; London, 3200 feet.

Water and Sanitary Notes.

The Local Board of Slough have adopted and solicit the co-operation of other local authorities in a course which, we hope, will be very generally condemned. They have appealed to the Local Government Board to tell them how to drain their district, and what to do with their sewage. "They are desirous that it "should devolve on the engineering inspectors of the Local "Government Board to determine the scheme of sewerage that "should be adopted for the district, it being merely left to the "sanitary authority to carry it out." Now, we must strongly protest against this suggested extension of the system of grandmotherly government. If the present members of the Slough Local Board feel themselves unequal to the task of draining their district, let them resign, and give way to men who will at least know where to find engineers whose plans will never be questioned by a Local Government Board inspector. Such are to be found, and, as a rule, they stand in the foremost rank in their profession. Government service in this country can never attract first-class men, unless they happen at the same time to be vain and idle men. It is different in France, where the system obtains which the Slough Board would wish us to adopt—where the local authorities are simply the instruments who carry out the dictations of the central authority. There, everything being in the hands of the Government, professional men look exclusively to Government for employment. But here, where the prizes to be won in private practice are so great, all able men avoid fixed State employment. The ranks of certain Government officials have been recruited from men who failed in private practice, or were too idle to attempt to succeed. They are not the men to dictate what Local Boards shall do in the present growing emergencies. Let the Boards be only self-reliant and liberal, and they may confidently challenge the decisions of Local Government Board inspectors. In any case, we look on the action taken by the Slough Board as a virtual resignation of the powers of local government, and we can only hope that the other authorities appealed to will leave them in their Slough of Despond, and seek wiser counsels when they project drainage schemes.

The Sheffield Corporation, as our readers know, opposed the Bill of the Wakefield Water Company in the last session of Parliament. In doing so, they ran up a nice little bill of £7200, which the ratepayers have now to settle. If the interests of Sheffield were really in danger, supposing the scheme of the Wakefield Company to have been carried out, the cost of the opposition might be considered small—indeed, a member of the council said that success would have been cheap at an expendi-

ture of £700,000. It is, however, a new pleasure for the Corporation of Sheffield to be able to spend money in opposition to a company without fear of an injunction, and we must say they have freely indulged it.

The Local Board of Morpeth have, for the present, cut off the supply of water for trade purposes, but seem to have had a little difficulty in settling the list of victims.

The Water-Works Committee of the Town Council of Carlisle have, we think, answered satisfactorily the complaints of the Infirmary Committee as to a deficient supply of water, to which allusion was made in these columns a few weeks ago. A supply of 100 gallons per head per day must be sufficient even for a hospital, and if the authorities of the infirmary do not trouble themselves to distribute it properly, a deficiency on some floors is their fault. It appears to us that a rearrangement of the fittings would remedy all that has been complained of.

The Local Board of Hexham have resolved on giving a constant supply of water under inspection which scarcely seems adequate. It is proposed to institute a careful and minute inspection of the town once a month. We rather think that the Board, if they wish to save water, will have to make the inspection continuous.

Some time ago, an inspector of the Local Government Board condemned the water at Bourton-on-the-Water as unfit for domestic use, and suggested a supply which would have proved costly to the village and sanitary authority. Before incurring any expense, the authority caused samples from various wells to be sent to Mr. Horsley, the public analyst for Gloucester, and he reports the condemned water to be remarkably pure. We do not like these conflicts of opinions on matters susceptible of easy determination. We do not know on what grounds Dr. Ballard condemned the waters, but probably it was simply because they were obtained from wells near houses, which just now are all in disrepute.

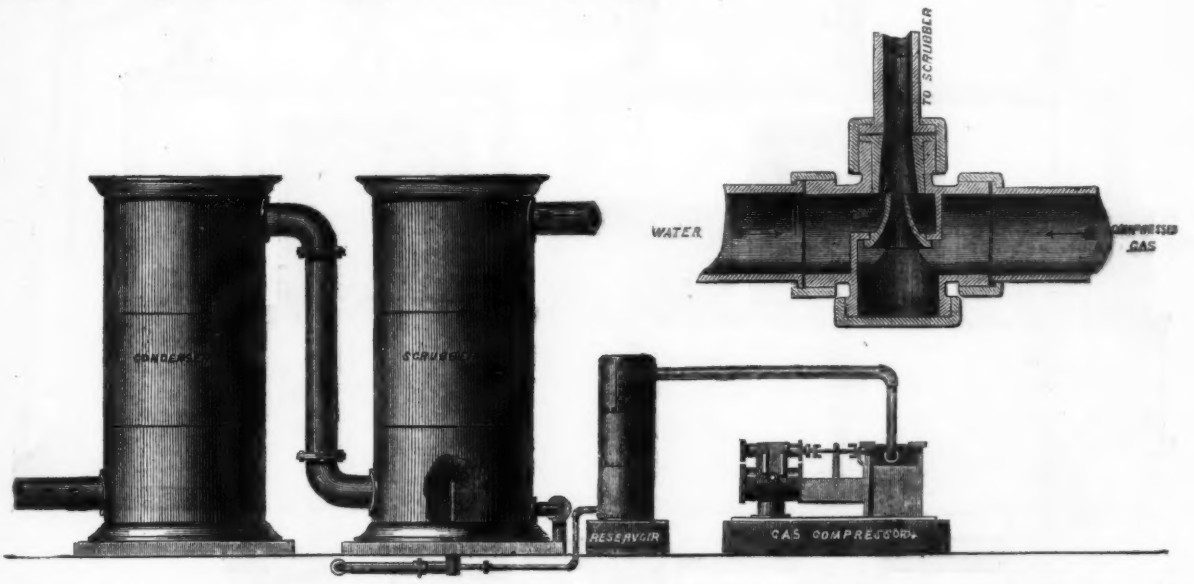
A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XXXV.

The Scrubber.

In the last chapter, when describing the improvements introduced by Mr. G. Livesey in the construction of scrubbers, it was remarked that the quantity of ammoniacal liquor obtained per ton of coal by this arrangement was not known. Mr. Livesey has since informed us that, in the years 1872 and 1873, the total quantity sold exceeded 22 gallons of 10-ounce strength per ton of coals carbonized.

In closing our observations on the subject of scrubbers, we refer to and illustrate an invention, patented in 1872 by Mr. B. E. Chollar, a young engineer of St. Louis, U.S.A., for "Purifying gas by atomized liquids," the principle of which is almost identical with that of MM. Pelouze and Audouin, described in the JOURNAL of Sept. 29.



According to this invention, the water or solution is injected in the form of vapour or extremely fine mist, by means of a jet of the gas itself, compressed by a small pump to the required extent (10 lbs. to the inch will in most cases suffice). This method is a close imitation of the natural process of condensation, with the important difference that the vapour—and the water can easily be so finely comminuted and dispersed as practically to be a vapour—is applied to the gas at so low a temperature that the NH_3, HS, CO_2, and other compounds, are very easily dissolved out. The scrubber contains no filling, and when the jet is introduced at the bottom the water will have to travel twice the length of the scrubber before escaping. The pump works in gas only, and is consequently not corroded by the liquor. The fineness of subdivision, as well as the quantity of water, can be adjusted at any time to suit the quantity of gas passing through the vessel, and without causing any back pressure.

The Exhauster.

This vessel, as its name implies, is for the purpose of exhausting or withdrawing the gas from the retorts. The earliest mention of exhausters is in the patent obtained by Broadmeadow in 1824, wherein he describes the means "for exhausting or drawing the gas, either directly or indirectly, from the retort, oven, or other apparatus, by means of an air-exhausting apparatus, which may be either in the form of that which is usually called a pair of bellows, or an air-pump, or any other convenient form, which is placed between the retort, oven, or other gas generator, so preventing the waste usually incurred by the escape of gas."

Having improved on this method, Broadmeadow in the following year acquired another patent, for "An apparatus for exhausting, condensing, or propelling air, smoke, or other aëriform products." He says in his specification: "This invention consists—first, in causing, by means of a suitable power, two gasometers, suspended one at each end of a beam or lever, to ascend and descend alternately in suitable tanks containing water. The interior of each gasometer is provided with an inlet and outlet pipe, the mouths of which are above the level of the water in the tanks. The inlet-pipes are provided with valves which open inwardly, and the outlet-pipes with valves which open in the reverse direction. When the gasometers are set in motion, the gas is alternately drawn into them until they become filled, and is then expelled therefrom." The patentee also describes the means of enclosing each gasholder, to the centre of which is attached a rod working through a stuffing-box, so that it acts as an exhauster, both in ascending and descending.

Although no drawings accompany the specification, the description is perfectly intelligible, but as the object was simply to reduce the loss of gas through leakage in the retorts, the economy to be derived not being adequate to the expenses of the machine, it was never practically applied.

We have already referred to the inconvenience experienced by Grafton, through the accumulation of carbon deposited in his ovens, and the means he adopted to remove it. But not satisfied with this, and suspecting it to arise from the pressure within the retorts, he entered into a series of experiments for the purpose of ascertaining the cause of its production.

Amongst other experiments, he submitted the gas to excessive pressure during the process of carbonization, which resulted in a remarkable increase of incrustation of carbon, this being upwards of 10 cwt. derived from the carbonization of 67 tons of coal. He then adopted the opposite means, by withdrawing all the pressure except about half an inch seal on the dip-pipes of the hydraulic main, when, with the same description of coal employed in the former experiment, he discovered that after four months continuous working scarcely any deposit appeared.

The general impression is that on Grafton becoming acquainted with these important facts, he obtained a patent for the exhauster, as an instrument for preventing the accumulation of the troublesome incrustation. This, however, is erroneous, for although the experiments alluded to were made about 1840, and the patent relating to the exhauster was obtained the following year, yet in this we find no reference to the removal of the carbon. According to the specification of the patent in question, Grafton's main object was to cause the tarry vapours given off during the first three hours of a charge (say of six hours duration), to pass into a vessel which he termed a "decomposer," by which means he expected to decompose these vapours and obtain a larger yield of gas. The decomposer was an oven, having circuitous divisions, charged with coke, and kept at a good heat by means of a furnace beneath.

The gas was conveyed from the oven where the coal was carbonized into and from the decomposer "by means of an exhausting vessel," but he says "the exhausting apparatus itself forms no part of my invention, but only the application of any suitable exhausting apparatus for the purpose aforesaid." The claim of the specification is "for the application of an exhausting apparatus to the decomposer, to facilitate or compel the passage of the gas through the said decomposer."

It is a singular circumstance that, although Grafton discovered the cause of the deposit of carbon on the retorts, yet, in practice, according to his patent, precisely the same effect would be produced by the deposit of the hydrocarbons in the decomposer, and consequently deteriorating the gas. Thus, although he ascertained the means of removing it in one instance, he deposited it in the other.

As the patent of Grafton possesses some interest, we give a copy of the drawings of the exhauster, of which fig. 1 is a longitudinal and fig. 2 a cross section. T T is a cast-iron tank, in which are three inlet-pipes, *m m m*, and a like number of outlet-pipes, *n n n*, fixed within the tank. The inlet-pipes are connected with the main pipe, I, each of them having on its top a clack-valve, *o*, opening upwards, thus preventing the gas passing otherwise than in the direction marked by the arrow. The outlet-pipes have similar valves, *p*, opening outwards, with a clearing-out box, *b*. The tank is filled with water or tar to the height indicated, and within it are suspended three gasholders, *z z z*, the chains of suspension passing over their respective curve-levers, to which their ends are attached. F F F is a frame for supporting the brackets, B B B; on which freely work the levers, *t t t*, and to these are connected the rods, *r r*. X is the end of a shaft, which extends the length of the apparatus, which shaft is provided with three cranks, one of those being opposite to the centre of each gasholder, and placed at equal angles to each other. To these cranks are connected the rods, *r r*. On a rotary motion being given to the shaft, by the return of the cranks, the three holders are alternately raised and lowered, thus receiving and expelling or exhausting the gas.

FIG. 1

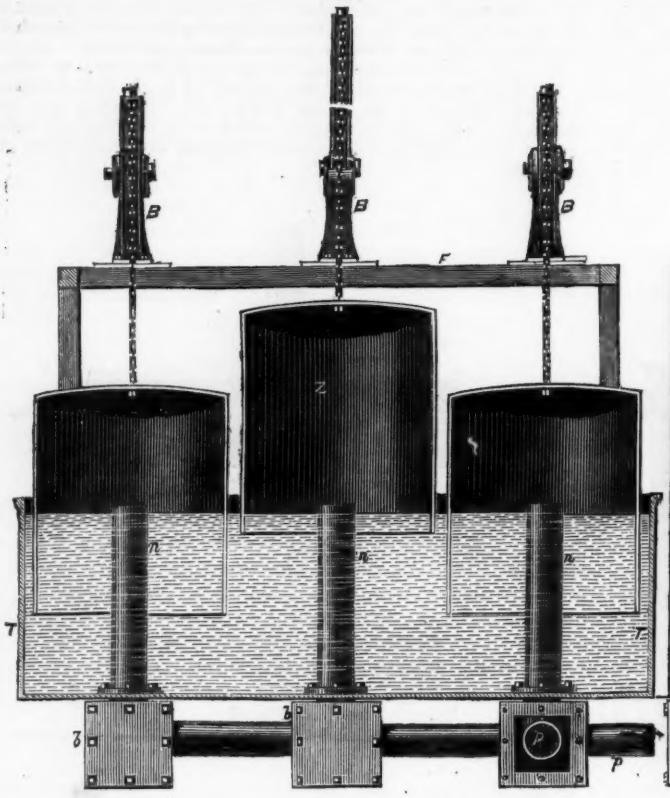
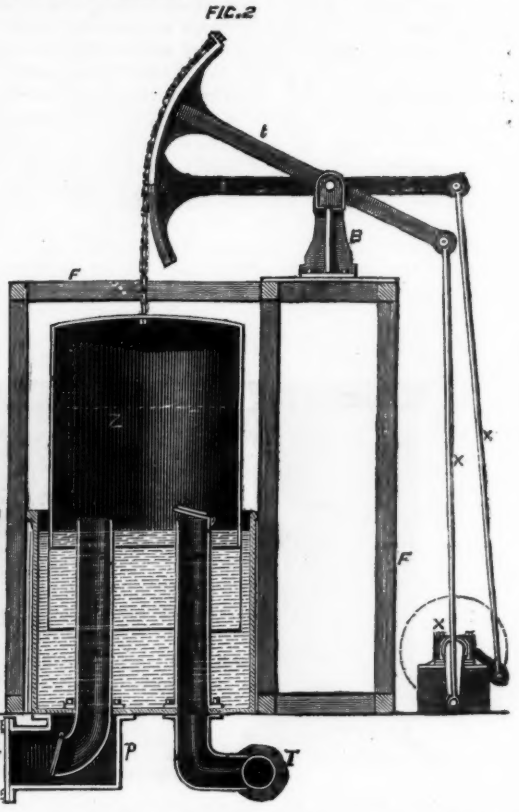
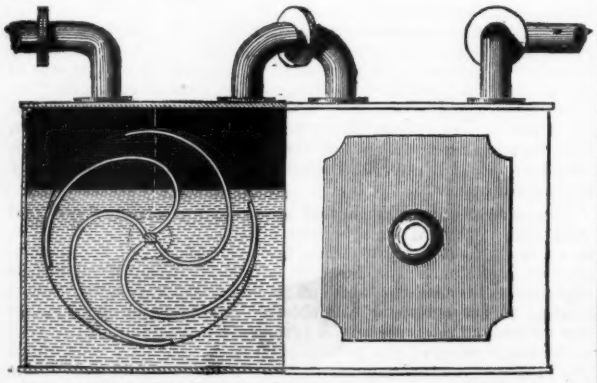


FIG. 2



The reader will recognize a remarkable similarity between this and the exhauster employed some years afterwards at the Pancras station of the Imperial Company. The shaft of Grafton's exhauster with its cranks has only to be placed on the top of the frame, so as to work directly with the gasholders, and they become identically alike.

Although it is evident that Grafton, at the time of obtaining the patent referred to, had no intention of applying the exhauster, as a means of preventing the incrustation of carbon within the retorts, he very speedily understood its importance; for, so early as 1845, exhausters of the form now to be alluded to were in operation at several continental works.



The system of gasholders not being effective, a modification of John Malam's meter-wheel was then adopted, as shown in the accompanying engraving, which represents a wheel, having four curved compartments, and a tube corresponding with the centre opening of the ordinary meter. The wheel in revolving drew the gas into each chamber in succession, and expelled it through the liquid and off by the tube, and so into the second vessel to the outlet.

The apparatus, as described, was generally used combined as a washer and exhauster; but such was the want of intelligence at that period, that sometimes there was neither pressure-gauge to indicate the amount of exhaust, nor the means of controlling or regulating the action of the machine; consequently, the gases of the furnaces, or atmospheric air, would often be intermixed with the gas, and at other times the apparatus would be at work without producing any beneficial effect. Under such conditions it was not surprising if the operations of gas companies were not remunerative.

The progress of the exhauster, like the introduction of clay retorts, was very slow in England. This is the more remarkable as both the one and the other were practically applied at some of the larger works in France two or three years before they were generally used in London.

It was not until about the year 1847 that the exhauster was employed for the first time at the Brick Lane station of the Chartered Company, under the superintendence of Mr. F. J. Evans. We believe the first apparatus of the kind there erected was the exhauster of Jones, of Birmingham, represented by the accompanying figure, and commonly called the "two eights," so named on account of the form of its most prominent parts. It consists of an oval-shaped cast-iron case, provided with its inlet and outlet passages. Within this are two solid pieces resembling the figure 8 (which we will call propellers), their length being equal to the depth of the case, each having an axle working in suitable bearings on the front and back of the machine.

The axles of the propellers protrude through the back of the exhauster, and on them are keyed two toothed wheels of equal diameter and number of teeth, by this means the position of the two propellers in relation to each other is constantly maintained. Motion being communicated, the propellers rotate in the direction of the arrows, and, in revolving, one end of each of them is in contact with the periphery of the case, and at the centre they are constantly in such contact with each other that no material quantity of gas passes at

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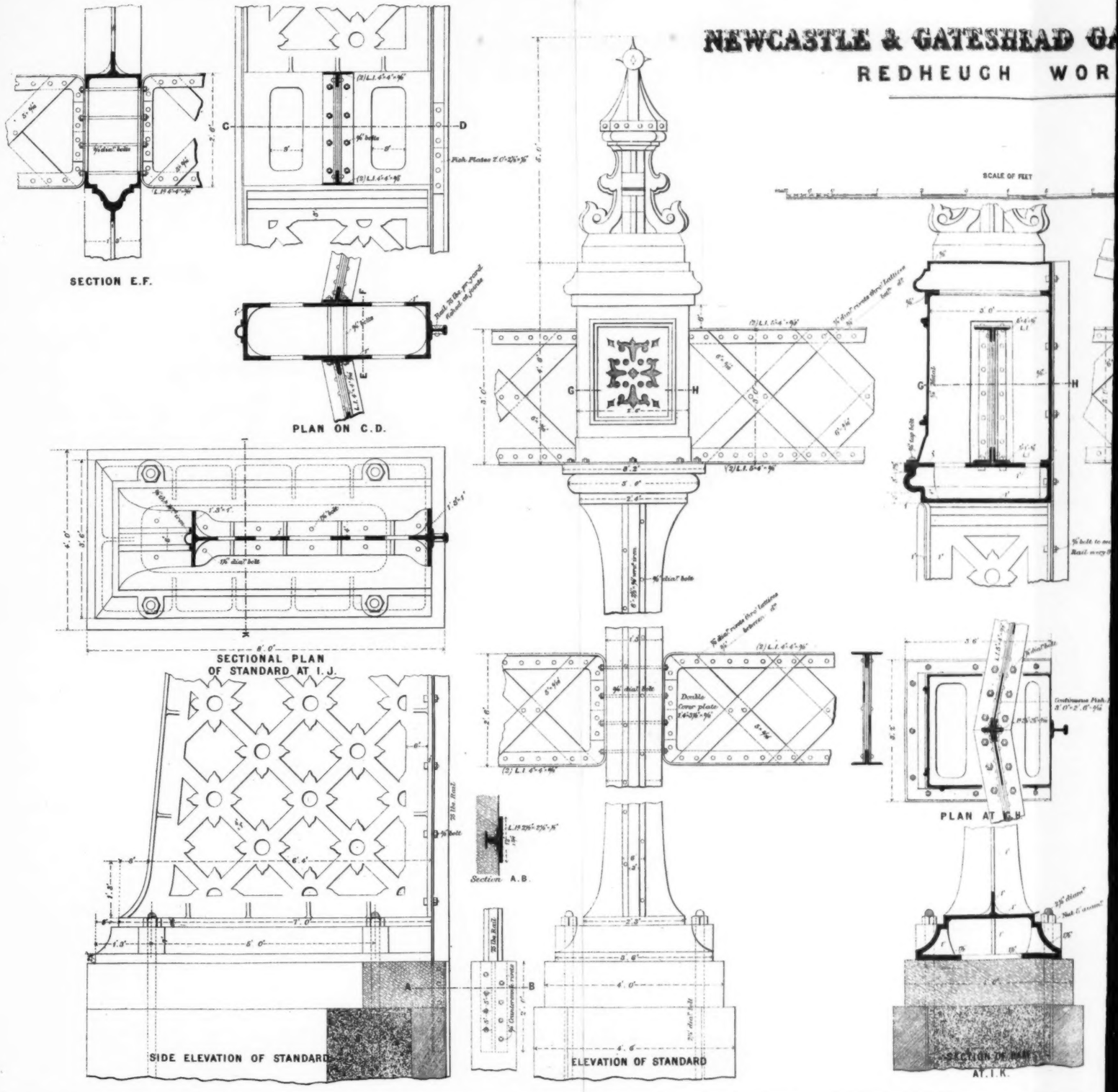
REDHEUGH WOR



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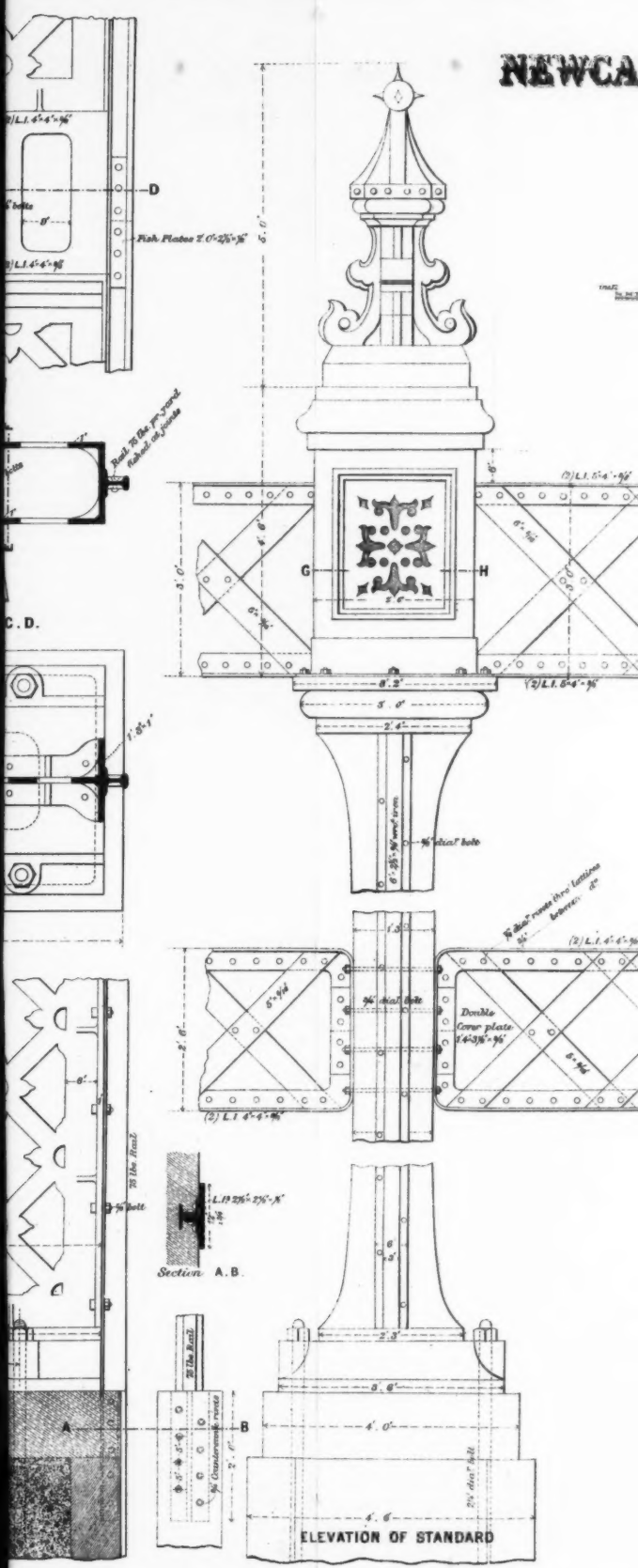

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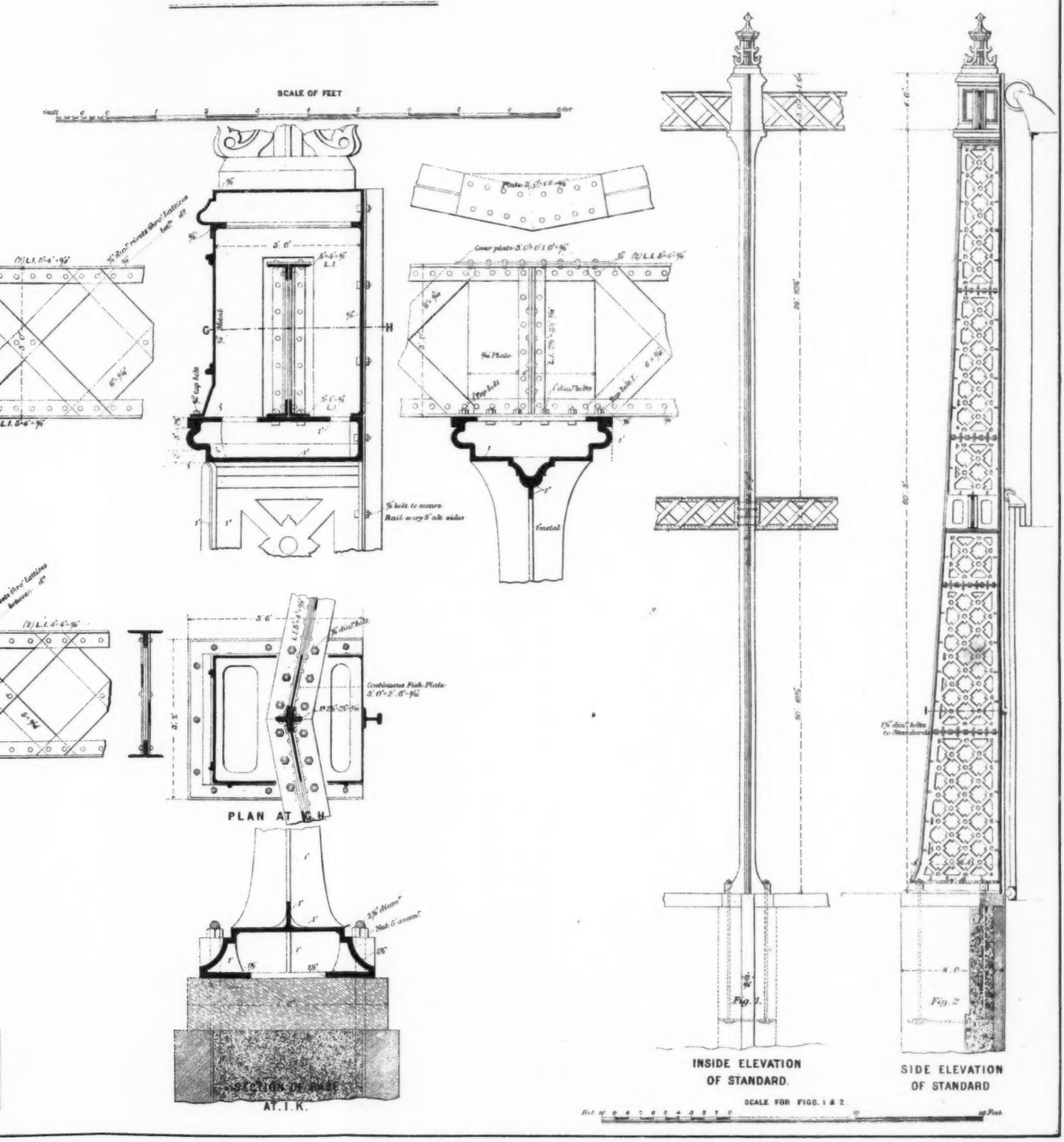
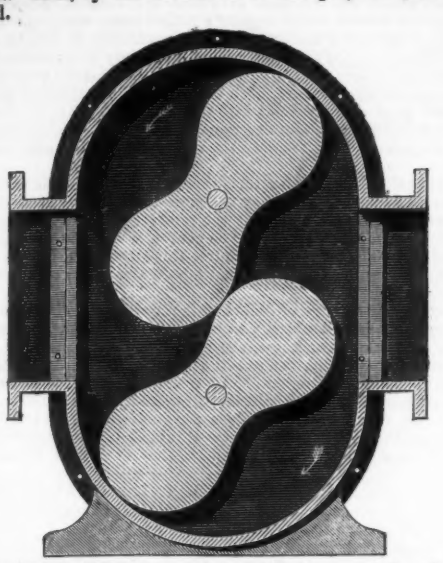
REDHEUGH WORKS.

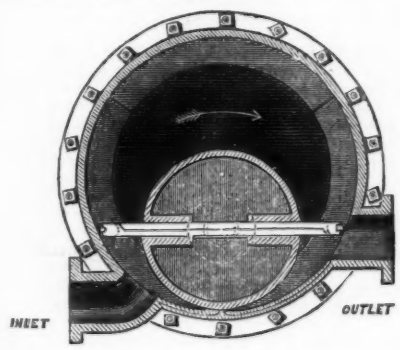


that point. Thus, by the revolution of the propellers, the gas is exhausted.



This machine is difficult to explain without several drawings or a model. It is very beautiful in conception, and has been largely patronized by the engineers of many works during several years.

The exhauster which next merits description is Beales's, shown in the annexed engraving. It consists of a cylindrical cast-iron case, with its inlet and outlet pipes attached. Within the case is another cylinder, the axis of which is eccentric to the case, its shaft protruding through a stuffing-box at the back, and on which is placed the driving pulley. The inner cylinder is provided with two sliding plates, or pistons, which divide the vessel into two parts; and, as the cylinder revolves, these pistons slide in and out, so that their ends are kept constantly in contact with the external case, the gas being received on one side of the pistons and expelled from the other, and, by this means, is exhausted. It is stated that Beales's exhauster, when well constructed, gives from 70 to 80 per cent. of effective power. It is caused to rotate with great rapidity, otherwise sensible oscillations would be experienced.



Gradually, the utility of this apparatus becoming recognized, it underwent several changes in form and mode of action. In 1850 we saw for the first time the piston and cylinder, with clack-valves, applied as an exhauster at the Newcastle works. A few months afterwards we witnessed in operation, at the Independent works, London, a double exhauster, acting with slide-valves, similar to two steam-engines placed side by side, the pistons receiving their motion from cranks on a shaft situated on the top of the frame; and from our experience during several years with an exhauster of this kind, the action was highly satisfactory, and left nothing to be desired.

The piston and cylinder have been applied in various ways for the object under consideration, sometimes running at a very high speed, so as to reduce the effects of the oscillation, sometimes with slide, at others with clack or seat valves, according to the judgment of the constructor.

Other engineers have adopted the one cylinder, in combination with an equalizing gasholder, counterbalanced to the desired pressure; so that any momentary excess of gas is exhausted into the holder, and is again withdrawn therefrom by the next stroke of the exhauster. In some cases the holder has been placed so as to control the throttle-valve of the steam-engine. The combinations of two or three cylinders, by which the exhaust is regular and continuous, there is reason to believe is the most correct method of employing this principle to an exhauster.

(To be continued.)

LANCASHIRE GAS-METER COMPANY, LIMITED.—The first ordinary general meeting of the shareholders of this company was held at Oldham, on Saturday, the 10th inst.—the mayor (Mr. Whittaker) presiding. The report of the directors, explaining the progress made with the erection of the works, &c., was read, and unanimously adopted. This company, which was incorporated in June last, has been formed for the manufacture of meters, and also general gas apparatus.

Correspondence.

PROPOSAL FOR A SLIDING SCALE OF DIVIDEND.

SIR,—A friend, well versed in gas matters, knowing that I favoured a sliding scale of price and dividends, has drafted a scheme for that purpose, which he has placed in my hands to use as I please, with liberty to alter in any way. I have thought it best to send it to you for publication unaltered, simply stating that with the principle I thoroughly agree, though I think the object may be attained by simpler means, the price of gas alone being probably sufficient to regulate the dividend. Still the paper goes so thoroughly into the question, in all its bearings, that I feel it should be placed before your readers entire.

With these remarks I leave the matter to the judgment of gas companies and the public, in the hope that the scheme will be fully discussed.

London, Oct. 10, 1874. GEORGE LIVESEY.

SCHEME OF REVISING PRICES OF GAS IN THE METROPOLIS UPON THE BASIS OF THE GAS-WORKS CLAUSES ACT (1847), METROPOLIS GAS ACT (1860), AND CITY OF LONDON GAS ACT (1868).

The scheme proceeds upon the basis that the price of gas shall not (under normal circumstances) exceed 3s. 9d. per 1000 cubic feet; that the illuminating power shall be, on the average, 16 candles for a 5-feet light, with a minimum of 14 candles, subject to a fine, tested with a 5-feet burner; *no* sulphuretted hydrogen; sulphur in other forms not to exceed 20 grains; maximum dividend not to exceed 10 per cent. upon ordinary shares, and upon other shares (preferential) or debentures at the several rates fixed by the statutes.

The normal ratio between capital, rental, and dividend to be thus:—Capital, £100; rental, £30; dividend, 10 per cent. Any increase in the capital without increase of rental to reduce the dividend, and so contrariwise. On the contrary, any increase of rental without increase of capital to increase the dividend, and so *vice versâ*.

To exemplify—

Normal capital, £100; rental, £30; dividend, 10 per cent. Deviation—Capital, £110; rental, £30; dividend, 9 per cent.; and so on.

On the contrary—Capital, £90; rental, £30; dividend 11 per cent.; and so on.

Again—Capital, £100; rental, £27; dividend, 9 per cent. Capital, £100; rental, £33; dividend, 11 per cent.; and so on.

Again, in the event of any company supplying *below* the maximum price of 3s. 9d., such company to be allowed an extra dividend beyond the 10 per cent. in consideration thereof. Such amount to be 1 per cent. increase over the 10 per cent. for every three pence per 1000 cubic feet reduction below the maximum price. But in this case such company not to be allowed an increase of dividend *both* for the above reduction in price of gas below the maximum, and *also* for rental being in excess of normal amount of capital (as formerly stated); but the company to have the selection only of the *one* mode in which the dividend is to be increased.

The whole of the above to be subject to the provisoes above written, and the *minimum* illuminating power to be 14 candles, subject to a fine if below.

The accounts to be made up and audited annually before Jan. 31 by the official auditor, who is to insert by advertisement in the *Gazette* or *The Times*, the rate of dividend to be allowed to each company for the ensuing year. Or, as hereinafter mentioned, in the event of revision of the price of gas *above* the maximum, then *also* the price of gas. But, in any case, no alteration to be made in the rate of dividend of fractional amounts, but to wait until circumstances will allow it to be altered a *whole* number.

We now come to a revision in the price of gas, arising from the increased cost of coal, and the decreased produce of residuals, the whole to be subject (except as hereinafter excepted) to the former normal scale.

The normal price of coals at the retort mouth (including all expense of delivery) to be 15s. per ton. The normal price of residuals (deducting labour of delivery into van or barge on the stations) to be 7s. 6d. per ton of coals. In the event of the remainder, as above, not amounting to 7s. 6d. per ton, then the company in question to have the right of demanding from the official auditor a price of gas *beyond* the maximum of 4d. per 1000 feet beyond such maximum for every 7s. 6d. per ton excess on the remainder; thus normal prices—coals, 15s.; residuals, 7s. 6d; remainder, 7s. 6d. But suppose coals, 25s.; residuals, 10s.; remainder, 15s.; then a rise in gas of 4d. Or again, coals, 22s.; residuals, 7s.; remaider, 15s., as last named, with similar results; but in this latter case the company to be subject to a diminution of 1 per cent. of dividend for every 4d. per 1000 of excess beyond the maximum. If any excess of profit is earned, such excess to be carried to a reserve-fund agreeably to the Gas-Works Clauses Act.

In this scheme no provision is made for increase in the prices of iron, wages, or materials. An increase in these things will be met primarily out of the reserve-fund, while a decrease will cause a reduction in the price of gas.

The consumer will be well protected by the *average* illuminating power not being under 16 candles, and the minimum not under 14.

Again, the consumers will derive great benefit by a reduction in the price of gas below the maximum, while the giving a higher dividend will stimulate the companies to greater economy and good management—or, to adopt modern phraseology, "paying by results"—while the companies will derive great benefit in being allowed to pay a higher dividend than the statutory maximum.

On the other hand, should the price of coals rise and the price of coke be unusually depressed, the companies will have the opportunity of recouping themselves by raising the price of gas; but, at the same time, by being obliged to reduce the dividend, they will share the loss with the consumers, and will be stimulated to endeavour to get the price of coals down to their former level, and the price of coke *up* to *its* former level.

PELOUZE AND AUDOUIN'S LAST PATENT.

SIR,—In reply to the letter of Mr. Wm. Mann, in the JOURNAL for Oct. 13, allow me to send you a few explanations required by your correspondent, who does not appear to have understood our "Process for Eliminating the Soluble Principles contained in Gases and Vapours."

The process consists in causing water or other liquids, previously reduced to a fine spray, to act upon the substances to be dissolved.

In the manufacture of illuminating gas, instead of obtaining the spray

of washing liquid by means of compressed air, the introduction of which would be injurious, we employ for the purpose the gas itself, acting under pressure.

To this end we temporarily borrow from the total make of gas (to be afterwards returned) a small quantity which we employ as the *separating agent* of the water we wish to reduce to spray. This quantity amounts to 35 cubic feet for about two gallons of pure water; but, thanks to the separating action of the gas, which is *introduced under pressure into the interior of the spray-producer*, these two gallons of water serve for the washing of more than 3500 cubic feet of gas by a single operation. Mr. Mann had reckoned 35 feet only.

As will be seen, this quantity of water (two gallons for 3500 cubic feet of gas) is much lower than that ordinarily employed in obtaining the complete absorption of the ammonia by washing in the scrubbers and other apparatus.

EUGÈNE PELOUZE.

Paris, Oct. 17, 1874.

RETORT SETTINGS.

SIR,—The importance of the subject, and the desire that it may receive further ventilation in your columns, must be my excuse for venturing to offer a few remarks on the setting of retorts, and on the views thereon which have recently* been propounded by the author of the "Treatise on the Manufacture and Distribution of Coal Gas."

There is ingenuity in the argument comparing the production of steam and coal gas, and it is plausible at first sight, but on closer investigation it will be seen that, in thus comparing the two processes, several important considerations have been omitted.

Indubitably, as the writer truly says, the laws relating to the conduction of heat are precisely the same under both circumstances. But this proposition does not state the whole case. Though the natural laws are invariable, yet *processes* differ, requiring a different application of these laws. Indeed, it is for the very reason that the laws are invariable that variety in their application is necessary, in order that by the agency of the natural forces which these laws represent, varying processes, requiring each different modes of manipulation, may be successfully performed.

Now, it appears to me that the writer referred to has been so intent on observing the constant identity of the laws relating to the conduction of heat that he has somewhat overlooked the important points of difference existing between the *modus operandi* of the production of steam from water in a boiler, and the distillation of gas from coal in a retort.

In the former process—viz., the production of steam, the vapour is retained in the boiler under pressure, an obstruction being offered to its free exit by the usual restricted openings into the cylinder of the engine, and a limited and regulated quantity only is allowed to pass away. The feeding of the boiler, too, is conducted with regularity, and no diminution in temperature is caused by a sudden large inflow of cold material. In the other process—viz., the distillation of gas, every impediment to the natural and easy passage of the gas is removed to the utmost extent possible, by allowing only the minimum amount of dip in the hydraulic main, or dispensing with dip altogether, and by the interposition of exhausters to hasten the removal of the gas from the retorts, and overcome the counter-pressure that is necessarily produced by the different purifying apparatus. In short, the gas is drawn away from the retort as quickly as it is evolved from the coal.

Now, were it not that the brickwork in the oven forms, as it were, a magazine of heat, which gives and takes according to the exigencies of the distillation, the retort, by the depleting influences to which it is subjected by the rapidly evolving gas, would be in danger of becoming reduced in temperature to a point below that at which carbonization can be economically conducted, in spite of all the firing that could be brought to bear.

It is important to keep in mind that the process of the destructive distillation of coal, as at present practised, is one of great irregularity, about 30 to 35 per cent. of the gas obtained being evolved during the first hour of the charge, and about 30 per cent. in the second hour, whilst the per centage of production rapidly decreases during the latter hours of the charge.

From these considerations, it would appear reasonable to conclude that the less brickwork there is in the setting of an oven or bench of retorts, the more irregular must the temperature of such an oven be when at work; the heat necessary for effective distillation in the earlier stages of the operation being mainly, if not entirely, dependent on the quantity of heat that can be generated directly from the furnace. On the other hand, where there is a considerable body of brickwork, the surplus heat emitted by the furnace during the latter hours of the charge, and not required for the evolution of gas from the now almost spent material, is being absorbed by the brickwork, to be given out again at the proper time, when the new charge is placed in the retorts. The brickwork thus becomes, as it were, a compensating reservoir of heat, and, as such, plays an important part in the economics of gas-making.

If these views be correct (and I shall rejoice to have them corrected if they are erroneous), it is evident, for the reasons advanced, that the less the quantity of brickwork, the more irregular must be the system of firing employed, in order to produce anything like satisfactory results. We all know, however, how difficult a matter it is to obtain gas stokers who will or can take an intelligent interest in their work, and modify their firing as the exigencies of the case require. When the charge is fresh, the firing would necessarily be very hard indeed, to give, unassisted, the amount of heat which is being so rapidly absorbed by the volatile constituents of the coal in assuming the gaseous form. And from the middle to the end of the charge, when the coal is quickly becoming exhausted, the firing would have to be greatly lessened in order to prevent unnecessary waste of fuel.

It appears to me, therefore, that a moderately large body of brickwork, in an oven or bench of retorts, acts, as regards *surplus heat*, similarly to the fly-wheel of a steam-engine in regard to *surplus force*, equalizing the varying action by giving out at the proper time the surplus heat imparted to it at those periods when the calorific power of the furnace is greater than is required for the evolution of the gas.

In further exemplification of these views, take the case of two benches of retorts set, the one with as much brickwork as could be put into it without obstructing the draught, or unnecessarily covering theretort surfaces; and the other having the least possible quantity of brickwork, supporting (say, for example) the retorts only at their extremities. In getting these benches in action for the first time, there can be no doubt the latter would be the first to attain the desired temperature; but although the former would require a little longer time, and the expenditure of more fuel at first, the superior regularity of its action over the other in distilling the gas from coal will scarcely be questioned.

Supposing further that the two benches in question were brought up to the required temperature, both being made equally hot, and that an equal charge of coal were put into the retorts in each, the firing of the furnaces being stopped simultaneously, will it be doubted which oven would longest continue to afford the required heat for efficient carbonization?

No doubt the thinner the retorts themselves, compatible with strength, the better, so that the heat may the more readily pass to their interior. But the circumstances attending the retort as the vessel containing the material for distillation are not to be confounded with those appertaining to the adjacent brickwork. Of course this latter need not be more than is reasonable, but it appears to me to be better to err on the side of too much than too little.

The extra per centage of fuel that is required in heating brick retorts and brick ovens is undoubtedly to be accounted for partly on the ground that, owing to their thickness, the heat does not penetrate them with sufficient rapidity; but remove the supporting brickwork (admitting that, for the sake of argument, to be practicable), and the disadvantages attending their thickness would be still more apparent.

Brickwork in a retort-oven does not *annihilate* heat; if it did, the argument of the author of the papers would be unexceptionable.

Gas-Works, Pernambuco, Sept. 20, 1874. THOS. NEWBIGGING.

* See JOURNAL OF GAS LIGHTING, Aug. 18, 1874.

RELATIVE PRICE OF COMMERCIAL & CHARTERED GAS.

SIR,—As a shareholder in the Commercial Gas Company, I have been struck by the letter in your last issue, signed "Justice."

Had "Justice" been only a little more just and less acrimonious in the comparison he draws between the Commercial and the Chartered Companies, in respect of their "study" of the consumer, he would hardly have practised so glaring a *suppressio veri* as to have blinked the fact that the former company's standard burner makes the same gas two candles lower in illuminating power than if tested by that of the latter.

"Justice" writes in such well versed style as compels me to the belief that he cannot fail to be aware of this fact, which entirely disposes of his figures.

He assumes the Commercial to supply 12-candle gas against the Chartered 16, and at the relative prices of 4s. and 5s. per 1000, his calculation would seem correct.

Let us see what the superintending gas examiner of the Metropolitan Board, Mr. Keats, says on this question of quality of gas supplied, in his evidence before the Revising Commissioners, in Feb., 1874. At page 217 of the evidence it will be found stated that for three months to Dec. 31, 1873, the Chartered gas averaged 17·12 candles, and the Commercial 16·10, when tested by same burner. The true comparison, therefore, will be—

	Per Candle.
Commercial, 16·10 candles, at 4s. per 1000 . . .	2·98d.
Chartered, 17·12 candles, at 5s. per 1000	3·50d.
Balance in Commercial Company's favour .	0·52d.

or 17½ per cent. No company is named by the chairman of the Commercial Gas Company in the report of the meeting, and I see nothing in his remarks more culpable than the complacent congratulations which usually fall from the chairman's lips on such occasions.

Before concluding, I should like to notice a remark in your "Circular" of the previous issue, in which you call attention to the Commercial deficit in last half year's accounts. Permit me to point out that had they raised the price to 4s. 6d., which they had power to do, and as most of the companies did, they would have had little or no such deficit.

In conclusion, I wish to say that I have only written, giving the comparative figures above contained, from a desire that the truth should appear.

I consider comparisons made in the spirit of "Justice's" letter to be in the worst taste, and to be worse than valueless when inaccurate or imperfect.

I see no reason to shelter under a *nom de plume*, and beg to subscribe myself,

HY. E. JONES, C.E.

Fairfield Villa, Bow, London, Oct. 17, 1874.

Legal Intelligence.

THE RAILWAY COMMISSION.

TUESDAY, OCT. 13.

(*Before Sir* R. PEEL, *Mr.* MACNAMARA, *and Mr.* PRICE.)

NITSHILL AND LESMAHAGOW COAL COMPANY *v.* CALEDONIAN RAILWAY COMPANY.

The commissioners this day gave judgment in this case, which was heard on the 6th and 7th inst., and reported in last week's JOURNAL.

Sir R. PEEL said this was a case of complaint of undue preference in the conduct of the coal traffic by the railway. The line of the Caledonian Railway Company, from Edinburgh to Glasgow, through Carstairs, has, at a distance of 21 miles from Edinburgh, a short branch of railway, called the Wilsontown branch, where there is a colliery belonging to the Haywood Coal Company; and further on, at a distance of 36 miles from Edinburgh, another and a longer branch of railway, called the Lesmahagow branch, on which are situated the collieries of Messrs. Thompson, Mr. Spencer, and the complainants collieries. The coal from all those collieries was sent to the port of Granton over the Caledonian Railway, for shipment to London and elsewhere. On the Lesmahagow branch the Caledonian Railway Company charged two rates for the carriage of coal to the port of Granton—a gas coal rate and a common coal rate; but cannel coal was the only coal charged at the gas coal rate. The Caledonian Railway Company had no similar classification on the Wilsontown branch, and on that branch they carried coal to Granton, including cannel coal, at the same rate—a rate per mile rather over the Lesmahagow rate for common coal. The only cannel coal sent to Granton from the Lesmahagow and Wilsontown branches was sent from the complainants collieries at Southfield. The complainants complained that an undue preference was given to Messrs. Thompson, Mr. Spencer, and the Haywood Coal Companies by the lower rate at which their coal was carried to Granton. The coal of the complainants was cannel; and, according to the evidence of Dr. Wallace, was used only for making gas. The coal of the other collieries was common coal, with seams of splint coal, which was easily separated in the working. The splint coal was carried to Granton by the Caledonian Company at common coal

rates; and the complainants alleged that the splint coal yielded such a quality and quantity of gas as to affect the demand for cannel coals, and that their fair interests were prejudiced by the inequality. The question was, therefore, narrowed as to whether splint coal and cannel coal had enough in common of gas-producing quality to be competitive, and to make it a prejudice or a preference under the Traffic Act if they were carried under similar conditions at unequal rates. Splint coal was used for making gas, but it had only been used for that purpose quite recently. It appeared to the commissioners that there ought not to be any difference in the rates at which they were carried. The present rates were these:—The complainants were charged for the carriage of their cannel coal or gas coal a rate of 5s. 1½d. per ton for a run of 57 miles to Granton, and the other collieries for their splint and common coal were charged a common coal rate of 3s. 10½d. per ton for a run of 54 miles. Those rates made a clear separation between the coal of the complainants and the splint coal. The defendants stated that the difference in the gradients in the Wilsontown branch and the Lesmahagow branch caused a difference in the rates that were charged, and the commissioners, therefore, enjoined the Caledonian Railway Company not in future to charge for cannel coal more than they charged for the carriage of splint coal, provided that due regard should be had to circumstances, if any, making a difference in the cost of carriage. The decision would in no way affect house coal.

The SOLICITOR-GENERAL, for the railway company, said his clients would consider whether they should appeal against the decision.

Mr. MACNAMARA, in reply to Mr. Littler, said there would be no order as to costs, as, the case being the first of its kind, the Caledonian Company were justified in raising the question.

MANSION HOUSE POLICE COURT.—WEDNESDAY, OCT. 14.

(*Before the* LORD MAYOR.)

EUPION GAS COMPANY'S SHARES.

The further hearing of the case against *Joseph Aspinall*, merchant, 33, Gresham House, City; *Samuel Gurney Fry*, 9, Dowgate Hill; and *George P. Knocker*, 155, Cannon Street, was taken this day. The charge against the defendants is that they unlawfully conspired with one J. S. Muir and others to obtain by false and fraudulent pretences, and to acquire to themselves and others on their behalf, various large sums of money, with intent to defraud certain members of the Stock Exchange, and whereby Mr. John Alers Hankey was, in fact, defrauded to the amount of £800 and upwards.

Mr. *Aspinall*, who had been admitted to bail in his own recognizances in £1000, and one surety in a like sum, duly surrendered, and the other defendants, who were not in attendance at the last hearing, were present when the case was called on.

Mr. BESLEY attended for the prosecution; Mr. GEORGE LEWIS. jun., solicitor, appeared for the defendant Aspinall; Mr. STRAIGHT, barrister, for the defendants Fry and Knocker; Mr. MONTAGU WILLIAMS represented others interested in the case.

Mr. *G. F. Parratt*, the chairman of the company, was recalled, and further examined by Mr. LEWIS. He said he had held an appointment for more than 30 years in the Treasury, and was at one time paymaster of the South Middlesex Volunteers. Being asked if his accounts in that capacity had ever been questioned, he replied in the negative. He never intended to put anything into this company, and did not. He was to receive 100 free shares as a qualification for acting as a director. He had never received the shares, in fact, up to that moment. If he had remained a director he would likely have received them. He had never seen any necessity of informing the public as to a matter with which they had nothing to do. He signed for one share, but did not pay for it. He was not present at the allotment of shares; but he was, nevertheless, voted present. Knocker, the secretary, said it was quite regular to do so, and he did it, not thinking there was anything in that. Witness was allotted 1000 shares, and Aspinall paid the money in respect of them. Aspinall told him it was a thing done every day. He had heard of "the roaring bear," but knew nothing of any "rigging" the market in respect of the shares.

Cross-examined by Mr. STRAIGHT, *witness* said he retired from the Treasury on a pension. He had never before been director of a public company. He never saw the defendant Fry until the previous day. Fees to the amount of £450 were to be divided among the directors at the end of the year.

By Mr. BESLEY (in re-examination): He was some time ill from the 21st of March, and was unable to attend the board meetings. The minute-book was brought to him, while he was ill, to be signed, and he signed it as chairman, though he was unable at that time to understand its contents. In fact, he was not then able to read. He was present at the meeting in May, with others, when a resolution was passed for borrowing £2000 from the Midland Banking Company. He understood that sum was borrowed on the strength of deposits. He had nothing to do with the preparation of the prospectus, and with the exception of the 1000 and 15,000 shares previously mentioned in evidence no other shares stood in his name. From the moment he joined the company he never had a share in it. He was simply the nominal holder of the 1000 shares referred to.

Evidence was then given to show that Aspinall and Muir were seen at the offices of the company at various times in May and June last, and the directors having made a point in their published prospectus that they had purchased the patent in question for £2500 of Mr. F. G. Voigt, the patentee, Mr. Voigt was called as a witness for the prosecution, and proved that the patent had been made the subject of two separate agreements between him and Muir, under one of which witness had received £100 odd, but that both agreements, in other respects, had become abortive. The result was that he never assigned the patent, and had it still.

Several witnesses, one a lad of 18 years of age, proved that, under instructions from their employer, a lawyer named Steel, in Chancery Lane, they had applied for allotments of shares in the company, at the same time filling up blank transfers, which were handed back to their employer.

The inquiry was then adjourned, the defendants being admitted to bail in their own recognizances of £500 each, and one surety of like amount.

FRIDAY, OCT. 16.

The defendants surrendered to their recognizances, and Mr. *C. Knocker*, the London manager of the Midland Bank, attended in anticipation of a summons issued against him on the previous day. Dr. *Muir*, for whose apprehension a warrant had been originally issued, also formally surrendered himself into the custody of Detective-Sergeant Webb at the opening of the court, explaining subsequently that he was out of England when he first heard of these proceedings, and that he had been travelling ever since in order to meet the charge, to which he had a most complete answer.

Mr. *Richard Spyer*, the chief clerk to the Registrar of Joint-Stock Companies, was examined, and upon leaving the witness-box the LORD MAYOR told him he hoped the registrar (the Hon. Edward Curzon) would give his particular attention to this investigation, for it seemed to him that the present system of registration was, at best, a fiction, and afforded considerable facilities for an evasion of the law. Mr. Spyer promised to convey this intimation to the registrar, whose attention had already been drawn to the matter.

Mr. *Parratt*, chairman of the company, was recalled, and cross-examined by the defendant, Dr. MUIR.

The other witnesses examined were persons who had filled up applications for shares in the company at the instance of Dr. Muir and others, to whom they gave at the time blank transfers for any shares that might be allotted them.

The further hearing of the case was adjourned until the 21st inst.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

THE GAS COMPANIES AND THE METROPOLITAN BOARD.—The Metropolitan Board of Works and the Corporation of the City of London have determined to apply in the next session of Parliament for powers to supply gas within their respective districts. The bills to be introduced will probably contain provisions for the construction of new works for the manufacture and distribution of gas; but, if the promoters are in earnest, their real object will be more reasonable and more defensible than the absurd project of doubling the expenditure already incurred in the provision of a necessary of life. The real question for Parliament to consider will be the future ownership of the existing works, and not the waste of an enormous sum and the sacrifice of valuable space in the erection of new gas-works. The inhabitants of London, even where they are indifferent to the spoliation of joint-stock property, would scarcely desire that every street in the metropolis should be disturbed by laying down a second set of mains for the purpose of rendering the existing distributive apparatus useless. That this is the scheme ostensibly recommended by certain members of the Board of Works and the corporation is only an additional illustration of the national tendency to conduct business by the machinery of fiction. In applying for power to construct works, the municipal bodies aim at a compulsory purchase, which they hope to effect on inequitable terms by the aid of a formidable menace. Eight years ago an attempt to confiscate a part of the property of the gas companies was universally condemned; nor has Parliament in a single instance allowed corporations to purchase gas-works against the will of their owners, even at their full value. The alternative power of establishing a subsidized competition, which it would be impossible to resist, has never been seriously claimed before a committee. Gas consumers have but a small and doubtful interest in th e transfer of the supply of gas from joint-stock companies to representative bodies. If the works are bought at a fair price, gas can neither be made cheaper nor better by a corporation than by a company; and the prospective reduction of price or improvement of quality as the consumption extends is an advantage common to both methods of supply. In Manchester and some other towns the corporation raises an income from the profits of supply for the benefit of the general community. If the supply were in the hands of the company, the surplus would, under the general law, be applied to the reduction of price. Although Parliament has hitherto declined to enforce the transfer of gas and water undertakings from companies to public bodies, it may be doubted whether it has not committed an error, though on the right side. It is much more important that property should be protected than that corporations should have the satisfaction of controlling the supply of gas and water; but shareholders, while they are entitled to the full income derived from their capital, have no further claim or interest. A landowner has a sentimental attachment to his fields, but a recipient of 10 per cent. on a given sum has no preference for one solvent paymaster over another. If a corporation consents to pay the annual income, giving sufficient security, the ratepayers may perhaps be pleased, and the gas and water shareholders are in no way hurt. In theory the consumers or their representatives ought to be the nominal holders of the surplus profits to which they are already entitled. The Gas Clauses and Water Clauses Acts of 1847 virtually effected the change of ownership which would be formally accomplished by a transfer. All gas companies, after paying their authorized dividends, and providing any reserve allowed by their special Acts, must apply their surplus profits to a reduction of rates. In other words, the consumers are the residuary proprietors, and the shareholders, as long as they earn their maximum dividend, are merely annuitants or mortgagees, and trustees of the surplus. It is consistent with principle that the beneficial owners should administer the estate, inasmuch as the shareholders have no motive for improving the property after their own incomes are fully secured. The holder of £1000 in the stock of one of the London gas companies is entitled either to £100 or, as the case may be, to £70 a year. The Acts provide that the price may be increased to the point at which his dividend can be earned. He is also entitled to the benefit of a further payment towards a limited reserve or insurance fund. If there are any other prospective advantages, they would be taken into account in settling the terms of a purchase; but, when all the claims of justice are satisfied, Parliament would be justified in establishing, although for the first time, the principle of compulsory transfer. If the Board of Works or the corporation were to reject equitable terms, their refusal to purchase would involve an acknowledgment that the works could not be more economically or advantageously conducted than at present.—*Saturday Review.*

Dr. Letheby, the chief gas examiner appointed by the Board of Trade, has recently reported to the Metropolitan Board of Works, the results of the daily testings of the gas supplied to London by the Chartered, the Imperial, and the South Metropolitan Gas Companies. He reports that the maximum, minimum, and average illuminating power of the gas at the several testing-places were as follows:—

Illuminating Power in Standard Sperm Candles.

	Company, Kind of Gas, and Testing-Place.	Max.	Min.	Aver.
Chart. Com.	Common gas, Beckton	20·1	16·9	18·00
	,, Friendly Place	17·8	16·1	17·05
	,, Ladbroke Grove	17·6	16·1	16·89
	Cannel gas, Millbank	23·0	20·0	21·28
Imprl. Com.	Common gas, Carlyle Square	17·4	15·9	16·89
	,, Camden Street	17·7	14·5	16·07
	,, Graham Road	20·5	13·7	17·93
	,, Bruce Terrace	19·5	18·2	18·73
	South Metropolitan Company, Hill Street	17·4	15·8	16·58

On all occasions but one the illuminating power of the gas at all the testing-places was above the requirements of the Acts of Parliament; and on that occasion—viz., the 30th of July last, the gas of the Imperial Company at Graham Road was only equal to 13·7 standard candles; but the deficiency of power was caused by the accidental presence of atmospheric air in the pipe at the testing-place.

As regards purity, Dr. Letheby reports that the gas of all the companies was constantly free from sulphuretted hydrogen, and that the maximum, minimum, and average amounts of sulphur in other forms than this were as follows:—

Grains of Sulphur per 100 Cubic Feet of Gas.

	Company, Kind of Gas, and Testing-Place.	Max.	Min.	Aver.
Chart. Com.	Common gas, Beckton	15·2	7·4	11·41
	,, Friendly Place	17·5	5·5	8·68
	,, Ladbroke Grove	26·4	14·3	17·95
	Cannel gas, Millbank	22·0	12·0	17·02
Imprl. Com.	Common gas, Carlyle Square	23·3	13·9	19·26
	,, Camden Street	18·5	8·5	13·04
	,, Graham Road	18·5	10·6	14·84
	,, Bruce Terrace	20·24	16·2	15·58
	South Metropolitan Company, Hill Street	23·6	8·4	12·94

The average amounts of sulphur in the gas at all the testing-places are greatly below the prescribed proportions, but the Chartered Gas at Ladbroke Grove contained a slight excess on one occasion, and the gas of the Imperial Company at Bow was very slightly overcharged with this impurity on two occasions—the result, as Dr. Letheby certifies, of accident from the early operations at these newly established works.

Ammonia was at all times below the prescribed quantity—the average amounts being from 0·02 of a grain to 1·16 grains per 100 cubic feet of the Chartered gas, and from 0·0 to 0·37 of a grain in the Imperial gas, and 0·42 of a grain in the South Metropolitan. These results show that the average quality of the gas at the several testing-places has been fully equal to the requirements of the Acts of Parliament.

LONDON GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of Proprietors was held at the Freemasons Tavern, Great Queen Street, Lincoln's Inn Fields, on Wednesday, Oct. 14—MAJOR ROHDE HAWKINS, Esq., the Governor, presiding.

The SECRETARY (Mr. A. J. Dove) read the notice convening the meeting, and the following report and statement of accounts were presented:—

Annexed to this report your directors submit the half-yearly accounts, showing the result of the manufacture and distribution of gas up to June 30, 1874.

The accounts now submitted to the proprietors are in a somewhat altered form, in accordance with the requirements of the Board of Trade.

The operations of the half year have been marked by the excessive cost of coal, and the relatively small return for coke. In making a comparison with the corresponding period of 1873, it will be found that the excess in the cost of coal has been £15,484 1s. 11d., and that the return for coke is less by £9146 15s. 10d., making together £24,630 17s. 9d.; by which amount the profits of the half year have been affected.

After reserving £10,364 4s. 11d., the amount required for dividends on the preference capital, and appropriating £750 to the redemption fund, in accordance with the provisions of the London Gaslight Act, 1857, the sum of £8448 4s. remains applicable to dividend on the ordinary capital. Your directors recommend that dividends be declared on all classes of preference stocks and shares at their respective rates, and at the rate of £10 per cent. per annum on the ordinary stock.

The increased charge for gas having produced an excess of only £10,450 15s. 9d., the reserve-fund, which has been formed for meeting such contingencies as the present, will be drawn upon for £10,469 6s. to make up the statutory dividend. The dividends will be paid on Oct. 15, 1874.

Your directors are able to report that the causes of the depression in the operations of the half year are to a great extent of a temporary character; for although the price of coke at present shows but little improvement, it may be anticipated that the result of the current half year's manufacture will prove more favourable than that of the past half year, the great fall which has taken place in the price of coal having enabled your directors to conclude more advantageous contracts for the current year.

The new retort-house, referred to in the last report as in course of erection, has been finished, and will be fitted ready for use during the winter of 1875.

The proprietors are aware that, since the last general meeting, the company have been deprived, by death, of its late governor, John Robert Hall, Esq., whose services to the company can scarcely be overrated. In accordance with the provisions of the Act of Parliament, a special general meeting of the proprietors was called for the purpose of filling up the vacancy, when the deputy-governor, Major Rohde Hawkins, Esq., was elected governor; and the Hon. Arthur Kinnaird, M.P., deputy-governor.

Juland Danvers, Esq., has been elected to fill the vacancy on the board.

No. 1.—STATEMENT OF STOCK AND SHARE CAPITAL, *on June* 30, 1874.

Acts of Parliament relating to the Raising of Capital.	Description of Capital.	Maximum Dividend authorized.	Number of Shares issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Arrears of Calls.	Remaining to be called up and unissued.	Total Amount authorized.
15 Vict., cap. 82	Ordinary stock.	10 per cent.	Stock	Stock	Stock	£378,350	..	..	£378,350
	2nd pref. ,,	6 ditto.*	Do.	Do.	Do.	14,450	..	..	14,450
	3rd ditto ,,	6 ditto.*	Do.	Do.	Do.	4,350	..	..	4,350
	1st ditto ,,	6 ditto.	Do.	Do.	Do.	150,000	..	..	150,000
29 Vict., cap. 55	A ditto shares	6 ditto.	7,622	£25 0 0	£15 0 0	158,215	£320 0 0	£32,015 0 0 / 109,450 0 0	300,000
20 & 21 Vict., cap. 73	Debenture stks.	5 & 6 ditto.	Stock	Stock	Stock	26,750	..	..	26,750

* With option of conversion.

No. 2.—STATEMENT OF LOAN CAPITAL, *on June* 30, 1874.

Acts of Parliament authorizing the Loan Capital.	Description of Loan.	Rates per Cent. of Interest.		Total Amount borrowed.	Remaining to be borrowed.	Total Amount authorized.
		4½ per cent.	5 per cent.			
15 Vict., cap. 82	Bond, &c.	£65,960	£75,232	£91,667	..	£91,667
29 Vict., cap. 55	Ditto			49,525	£38,332	100,000

No. 3—CAPITAL ACCOUNT.

Dr. *Cr.*

To Expenditure, to Dec. 31, 1873		£806,119 4 3	
Ditto, during half year to June, 1874—viz.:			
To lands acquired, including law costs.	£4,130 7 11		
New buildings and machinery in extension of works	13,047 13 5		
New and additional mains and services	2,028 6 3		
	£19,206 7 7		
Less excess in meters returned to store	133 18 3		
		19,072 9 4	
		£825,191 13 7	
Balance		10,700 15 0	
Total expenditure		£835,892 8 7	
Balance		37,415 6 5	
		£873,307 15 0	

Description of Capital.	Certified Receipts to Dec. 31, 1873.	Received since that date.	Total Receipts to June 30, 1874.
By Ordinary stock	£378,350 0 0	..	£378,350 0 0
2nd Preference ditto.	14,450 0 0	..	14,450 0 0
3rd ditto ditto.	4,350 0 0	..	4,350 0 0
1st ditto ditto.	150,000 0 0	..	150,000 0 0
A ditto shares, £25 each, including amount received in anticipation of calls	148,347 10 0	£9,867 10 0	158,215 0 0
Debenture stocks, under 20 & 21 Vict., cap. 73	26,805 2 6	*	26,750 15 0
Bonds and other loans	133,392 0 0	7,800 0 0	141,192 0 0
	£855,694 12 6	..	£873,307 15 0

Note * £54 7s. 6d. redeemed.

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—			
Coals, including dues, carriage, unloading, and trimming (see Statement No. 8)	£77,317 7 6		
Salaries of engineers, superintendents, and other officers at works	1,642 5 2		
Wages (carbonizing)	10,333 11 4		
Purification, including £858 7s. 5d. for labour	1,653 10 2		
Repairs and maintenance of works and plant, materials, and labour	£9,919 17 10		
Less received for old materials	212 15 1		
	9,707 2 9		
		£100,673 16 11	
The Gaslight and Coke Company, for cannel gas		7,125 6 8	
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	1,996 8 3		
Repairs, maintenance, and renewals of mains and service-pipes, including labour	376 5 6		
Repairs and renewals of meters	1,572 9 9		
		3,945 3 6	
Public lamps—			
Lighting and repairing		1,533 5 9	
Rents, rates, and taxes—			
Rents payable	926 12 6		
Rates and taxes	3,769 2 8		
		4,695 15 2	
Management—			
Directors allowance	900 0 0		
Company's auditors	75 0 0		
Salaries of secretary, accountant, and clerks	932 15 0		
Collectors commission	1,978 5 10		
Stationery and printing	309 14 9		
General charges	1,445 16 7		
		5,641 12 2	
Law charges		210 6 10	
Bad debts		384 4 8	
Depreciation-fund for works on leasehold land		100 0 0	
Superannuations, sick allowances, and gratuities		528 3 0	
Repairs of houses		104 14 5	
Total expenditure		£124,942 9 1	
Balance carried to net revenue account, No. 5		23,611 1 2	
		£148,553 10 3	

By Sale of gas—			
Common gas, per meter, at 3s. 9d. and 4s. 6d. per 1000 cubic feet	£94,248 8 8		
Cannel gas, per meter, at 5s. and 6s. per 1000 cubic feet	7,489 1 7		
Public lighting, and under contracts—			
Common gas	9,410 18 0		
Cannel gas	1,577 2 2		
(See Statement No. 10.)			
	112,725 10 5		
Rental of meters	1,909 1 6		
		£114,634 11 11	
Residual products—			
Coke, less £1645 2s. 6d. for labour and cartage	22,973 5 5		
Breeze, less £240 1s. 7d.	1,387 3 10		
Tar, less £38 5s.	5,006 12 10		
Ammoniacal liquor	3,192 19 9		
		32,560 1 10	
Rents receivable		1,350 16 6	
Transfer fees		8 0 0	
		£148,553 10 3	

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Dr. *Cr.*

To Interest on bonds to June 30, 1874		£3,321 18 1	
Dividends on preference capital		10,364 4 11	
Interest on temporary loans		726 14 2	
Redemption-fund, reserve, per London Gaslight Act, 1857		750 0 0	
Balance applicable to dividend on ordinary capital		8,448 4 0	
		£23,611 1 2	

By Balance from last account		£30,254 2 9	
Less dividend for the half year ending Dec. 31, 1873—			
On preference capital	£10,194 18 3		
On ordinary capital	18,917 10 0		
	29,112 8 3		
Amount carried to reserve-fund to Dec. 31, 1873	£1,141 14 6		
Amount from revenue account, No. 4		£23,611 1 2	
		£23,611 1 2	

No. 6.—RESERVE-FUND.

Dr.		*Cr.*	
To Balance on June 30, 1874	£22,287 8 8	By Balance on Dec. 31, 1873	£20,814 0 6
		Interest on amount invested	331 13 8
		Amount brought from net revenue for the year 1873.	1,141 14 6
	£22,287 8 8		£22,287 8 8

No. 7.—DEPRECIATION-FUND (for Works on Leasehold Land).

Dr.		*Cr.*	
To Balance on June 30, 1874	£1,100 0 0	By Balance on Dec. 31, 1873	£1,000 0 0
		Amount brought from revenue account for the half year ending June 30, 1874	100 0 0
	£1,100 0 0		£1,100 0 0

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1873.	Received during the Half Year.	Carbonized during the Half Year.	Used for Sundries during the Half Year.	In Store, June 30, 1874.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	11,550	57,682	53,902	30	15,300
Cannel	574	3,083	2,391	..	1,266

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, Dec. 31, 1873.	Made during the Half Year. Estimated.	Used during the Half Year. Estimated.	Sold during the Half Year.	In Store, June 30, 1874.
Coke, chaldrons of 36 bushels	5,365	52,992	13,084	42,020	2,353
Breeze, " "	579	8,519	829	7,402	867
Tar, gallons	104,000	553,027	..	579,027	78,000
Ammoniacal liquor, butts of 108 gallons	1,963	9,478	..	10,311	1,130

No. 10.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity (measured by Station Meters).		Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
	Made.	Purchased.	Public Lights and under Contracts (Estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	534,769	37	39,374	422,063	461,437	5,399	466,836	67,970	3,975
Cannel	..	31,091	4,273	25,200	29,473	2	29,475	1,616	839

BALANCE-SHEET.

To Capital—		By Cash at bankers, and in hand	£19,288 3 9
For balance, per account No. 3	£37,415 6 5	Amount invested—	
Net revenue—		Reserve-fund	22,287 8 8
For balance, per account No. 5	8,448 4 0	Stores on hand, viz.—	
Reserved fund—		Coals	£24,261 9 0
For balance, per account No. 6	22,287 8 8	Coke and breeze	1,274 0 0
Depreciation-fund (for works on leasehold land)—		Tar and ammoniacal liquor	1,098 6 9
For balance, per account No. 7	1,100 0 0	Sundry stores	3,930 17 2
Redemption-fund	426 13 0		30,564 12 11
Interest on bonds and other loans, for amount due to June, 30, 1874.	1,854 1 6	Accounts due to the company—	
Preference dividends, ditto	10,364 4 11	Gas & meter rental, quarter ending June 30, 1874	£37,143 12 3
Unclaimed dividends	3,677 15 0	Ditto, arrears outstanding	4,818 5 8
Sundry tradesmen and others, for amount due for coals, stores, and sundries.	42,957 13 11		£41,961 17 11
		For coke and other residual products	13,937 12 0
		Sundries	491 12 2
			56,391 ● 1
	£128,531 7 5		£128,531 7 5

The GOVERNOR: Gentlemen, I shall have a few remarks to make to you today in moving the adoption of the report, because I am sorry to say that our working during the past half year has not been so favourable as on previous occasions. This is a matter which is very easily explained. Most of you are sufficiently acquainted with the manufacture of gas to know how it is, and our accounts show the cause of it pretty plainly. It is due to the very high price we have had to pay for our coals, and to the fact that we have made comparatively little by our coke. Last year we were better off, for though coal was then at a high price, we were getting a high price also for our coke, and so well did the products answer our purpose that, although we were paying nearly cent. per cent. more for coal, we were only obliged to add 20 per cent. to the price of gas, the other 80 per cent. being made up by the increased value of residuals. But when we came to the half year under review we turned over from Christmas a considerable stock of coal in store, and this stock is an absolute necessity, for we burn three times as much coal at Christmas as we do at Midsummer; and at the beginning of the year we have generally a certain amount of trouble with the weather, which makes it absolutely necessary to have two or three weeks store on hand. We had, therefore, a considerable stock, and we had also a contract still running at a high price, so that in point of fact the bulk of our coal in the half year was bought at a high rate, but our coke dropped to fully half the price it had previously been. This accounts for the large diminution in the results of our working. Since then we have been able to make much more favourable contracts for coal, and our coke has not fallen any further in value. Speaking, therefore, without any pretence to great accuracy, I think the probability is that in the current half year we shall nearly make up the losses of the last, and that when we meet you again our reserve-fund, which has proved a very valuable asset on the present occasion, may be reinstated. There is another matter, not mentioned in the report, to which I wish to refer, and that is the agitation out of doors with regard to the gas question, and the pressure which the Metropolitan Board of Works and the Corporation of the City of London are talking about putting on us. I believe on all subjects of this nature, particularly when there are representative assemblies like the Board of Works and the corporation, it will always be found that there are talkative, energetic, and I may say ambitious persons, who are extremely forward to recommend some vigorous measures. And perhaps it is desirable they should, especially when they are introduced at an early period, for it gives time to the quieter members—the men who really do the work in these public bodies—to look calmly and dispassionately at the question in all its bearings; and if you watch the thing carefully you will find that the influence of these members is felt more and more as time goes on. My own opinion is that when Parliament meets we shall hear very little indeed about the proposals of which so much has been said lately. The public outside are really very ignorant of the position of the gas companies. They have some vague notion that the companies are dividing 10, 20, or even 30 per cent. among their shareholders, and are otherwise benefiting themselves at the cost of the consumers. Now, without going into the question of how other companies stand, I will only say that, having looked carefully into the position of our own company, I am sure the public would be much astonished to know that it is with the greatest possible difficulty we manage to pay our way, and that the whole interest on our capital, borrowed money, debentures, bonds, preference shares, and ordinary stock, is only about 7½ per cent. I certainly think that those trading gentlemen in the City of London who complain so much of our profits would not be very willing to accept 7½ per cent. on their own business transactions, and, therefore, ought not to grudge us what we get by a great expenditure of capital, labour, and anxiety. If, however, they think it worth while, we are quite willing that the City Municipality or the Board of Works should buy us up, providing they do so at a fair price. Ours is a mercantile undertaking; we only want fair returns for our capital invested. Here are our accounts published in the form directed by the Board of Trade; there is no disguise about anything. Let them come in and give us a fair price if they want the power to supply gas themselves, and I am sure we should be quite willing to sell. As to going into competition with us, breaking up the streets, laying down new mains, and opposing us in that way, I do not think the representatives of the greatest mercantile City in the world would be likely to sanction a scheme of confiscation, which this would be absolutely; and I think that, looking at the political state of things in the last year, we can confidently foretell that the people of England would not be prepared to go into anything that bears even the semblance of confiscation, or strong-minded legislation. They have shown their utter dislike to such a course, and I am certain that when Parliament assemble, if anything like the propositions we have heard in connexion with this question are brought forward, they will meet with the most determined opposition in both Houses. As long as we conduct our business in a straightforward, honourable manner, I am persuaded we shall never be troubled by anything like competition from the Metropolitan Board or the corporation, who have already quite enough to do to attend to their own business. I now move the adoption of the report.

Mr. RHODES seconded the motion, which was put and carried.

The DEPUTY-GOVERNOR (the Hon. A. Kinnaird, M.P.,) moved—"That the following dividends be declared—viz., the fixed dividends upon all classes of preference stocks and shares, and also a dividend at the rate of 10 per cent. per annum on the ordinary stock, for the half year ending June 30 last—such dividends to be payable on the 15th inst."

Mr. RHODES seconded the motion, which was put and carried.

Mr. FORD: There is a thoughtful reference in the report to the late governor of the company, and to the services which we received from him. I think it would be right that this meeting of shareholders should record, in an appropriate resolution, the opinion we all entertain of the loss sustained by us in the death of Mr. Hall. I shall have much satisfaction in moving such a resolution, which will, I am sure, meet with the full approbation of those present, and will, though perhaps inadequately, represent the feelings of absent shareholders.

The DEPUTY-GOVERNOR: I beg leave to second the motion. It is clear that we could not, from this side of the table, submit the proposal, but the directors have privately expressed a hope that it would emanate from the general body of shareholders. As one who long acted in the management of the affairs of

the company with Mr. Hall, I can substantiate all that has been said by the mover as to the devotion of the late governor to the interests of the shareholders, and the invaluable services which he rendered us.

The GOVERNOR: It will not be necessary formally to put the resolution to a vote. We all at once accept it as a tribute to the memory of a gentleman so long and so usefully associated with the company.

Mr. FORD: I beg to propose a vote of thanks to the new governor and the directors for their successful management of our affairs. From the very clear and able statement made by Mr. Hawkins, I feel perfectly satisfied that the long experience he has had in conjunction with the late Mr. Hall will be fruitful in benefit to the company. I may also say that I feel great satisfaction in finding that the directors have appointed Mr. Danvers to a seat on the board. Mr. Danvers holds a financial position in connexion with the Indian Government, which entitles him to our fullest confidence, and any shareholder who has the personal knowledge of him that I possess will feel, as I do, that we have in him a most valuable acquisition to the board. Not only has he the high personal qualification of honour and integrity, but he has also had a very large commercial experience, and I believe he will devote the best of his energies to the service of the company.

Mr. DOWNS seconded the vote of thanks, which was put, and carried unanimously.

The GOVERNOR: Gentlemen, on behalf of my brother directors and for myself I beg to thank you most heartily for the manner in which you have received this vote. I confess I was a little nervous in having, on my first appearance here as governor, to make the announcement of so large a deficit in our profits. I feel the more grateful that you accepted the statement considerately, and I hope the next time we meet we shall present you with a much more favourable report.

Mr. FORD: Have you ever made a calculation to ascertain what—if we had paid the dividends which we might reasonably have expected from the commencement of the company—the average rate would have been? I think it would be considerably below 7½ per cent.

The GOVERNOR: For some years we never had any dividend at all. No dividend was paid on our ordinary shares from June, 1847, to Dec., 1858, and then only at the rate of 3 per cent.

On the motion of Mr. RHODES, a vote of thanks was presented to the auditors, the secretary, the engineer, and the other officers of the company.

Mr. RAWLINSON: I do not know if it might be satisfactory to the shareholders to hear a few remarks from me about the present popular agitation. I necessarily, from my position, hear a great deal of it, not only in London but in other parts of the country. Now, I think it is worth while for all shareholders and directors to consider this aspect of the question—that if it is the popular wish that gas-works and water-works should be in the hands of the municipal bodies, and if a municipal body should be established in London, whether it would be wisdom on the part of the great companies to fight needlessly against the arrangement; whether they ought not firmly and authoritatively to say, "We have served the public to the utmost of our ability to the present time, and if you wish now to acquire our property, all we desire is that you should deal equitably with us; we want no favours. Purchase our interests if you like, on fair and proper terms, and then try if you, who represent the public, can do better than we have done." I can only speak for the company I have the honour to be associated with, and I assure you I am speaking more in regard to my brother directors than myself when I say that it is impossible for an establishment to be conducted more honestly, with greater care and attention, and with a more prudent economy than this company is conducted. Our engineer and secretary are exemplary in their conduct, and are most attentive to their duties; and, for the directors, I may confidently assert that we do our utmost, not by absurd, ridiculous cheeseparing, but by the exercise of every true and just economy, to manufacture gas at the cheapest possible rate, so that the public may be supplied at the lowest possible price. We are restricted, as you know, by Parliament to a very great extent; indeed, there are restrictions upon gas-works which I am not aware exist in reference to any other similar undertakings. There is a jealousy also about gas companies, and there have been the most scandalous imputations cast upon them such as I have never known to be cast upon any other companies. It is for us to say, as we certainly can do, that there is no true and just ground for these charges, but if the time has come when a change is desired, then give us a fair equivalent for our property, and, in God's name, take the works.

The proceedings then closed.

SHEFFIELD WATER-WORKS COMPANY.

An Extraordinary Meeting of Shareholders was held on the 12th inst.—Mr. MARPLES in the chair—to authorize the directors to borrow money under the powers of the company's Act, 1867.

The CHAIRMAN said the business to be brought before the meeting, though somewhat of a formal character, was still important. It was necessary that they should be called together, for without their order, made in general meeting, the borrowing powers of the company with respect to the E shares recently paid could not be exercised. There were two ways open to them to pursue. The first was to make calls on the E shares, and from which, as they were aware, they would have to pay a preferential dividend of 5½ per cent. per annum. The second was to borrow such sums as might from time to time be required within their statutory limits in the open market on the most advantageous terms they could; and which terms of borrowing they had reason to believe would be considerably below what they would have to pay on calls. He might remark that taking the loans contemplated by that meeting, in conjunction with those previously authorized and open to renewal, they had offers of various sums amounting in the whole to many thousand pounds at 4 per cent. That was the rate upon which they were now paying, and the board was at present inclined to feel that it ought not to be exceeded. Having regard, therefore, to the interests of the company, it appeared to the board that there could not be two opinions as to the course to be adopted that day. He would therefore move the following resolutions, embracing, as they did, three distinct objects:—

1. "That the directors shall from time to time, as they think expedient, borrow on mortgage, under the powers of the Sheffield Water (New Works) Act, 1867, any sum or sums not exceeding in the whole the sum of £55,333 6s. 8d., being the second one-third part of the sum of £166,000 which the company are by the said Act authorized to borrow, or any part of such sum of £55,333 6s. 8d."

2. "That the directors shall from time to time, as they think expedient, reborrow on mortgage, under the powers of the same Act, any sum, part of the sum of £55,333 6s. 8d., the first one-third part of the sum of £166,000 which has been authorized to be borrowed under the powers of the said Act, and which has been or may hereafter be paid off."

3. "That the directors shall from time to time, as they think expedient, reborrow on mortgage, under the powers of the said Act, any sum, part of the sum of £55,333 6s. 8d., the second one-third part of the sum £166,000 by the first resolution now passed authorized to be borrowed under the powers of the said Act, which may hereafter be paid off."

The resolutions were seconded by Mr. S. ROBERTS, and adopted unanimously. This concluded the proceedings.

REDUCTION IN THE PRICE OF GAS.—The Northampton Gas Company announce a reduction of 3d. per 1000, and as a reduction of 6d. was made at Lady-day last, the price of gas is now 4s. 3d. per 1000 cubic feet.

NEWCASTLE AND GATESHEAD GAS COMPANY.

NEW GASHOLDER AT BEDHEUGH.

The fifth and last of the series of working drawings prepared by Mr. V. Wyatt for this holder is published with the present number of the JOURNAL.

The framing for guiding the gasholder is made up of 16 cast-iron standards, united by two horizontal ties of wrought-iron bracing. Each standard is 60 feet 3 inches high from the coping to the under-side of cap, formed of five castings. The metal is 1 inch thick throughout, except at lower part of the base, which is 1⅛ inch. There are internal flanges to the joints 4 inches wide in the clear by 1 inch, having 1¼-inch bolts to secure the same together.

The cast-iron standards forming the framing are connected together by bracing twice in the height. The centre of the first tier of bracing is 30 feet 1½ inch above the top of the coping of the tank. It is 2 feet 6 inches deep, composed of wrought-iron flanges, each formed of two angle-irons 4 inches by 4 inches by ⅜ inch, with lattices 5 inches by $\frac{5}{16}$ inch, secured at each end by two ¾-inch diameter rivets. The ⅂-irons are cranked down the standards at each end 1 foot 3 inches, and covered at joint by a double-cover strip 1 foot 4 inches by 3½ inches by ⅜ inch. At each end of the bracing girders there are No. 8 ¾-inch diameter bolts, four on each side of web, as shown on the details, passing through the standards and the two ends of the bracing girders.

The upper tier of bracing is, at its centre, 61 feet 6 inches above the top of the coping of tank, and is formed of flanges, each composed of two angle-irons 5 inches by 4 inches by ⅜ inch, rivetted side to side with 4-inch centres and ¾-inch diameter rivets and lattices 6 inches by $\frac{5}{16}$ inch, rivetted with two ¾-inch rivets at each end. The bracing girders are made continuous all round the circumference of the framing, and pass through slots formed in the caps of the columns. At the ends of each division of the bracing, over the centre line of each column, there are four angle-irons, each 2½ inches by 2½ inches by $\frac{5}{16}$ inch, placed vertically between the upper and lower flanges, and a vertical web or fish-plate 2 feet 6 inches by 3 feet by $\frac{5}{16}$ inch, to fish the bracing girders together, passing between the angle-irons and rivetted thereto, as shown in the details. Over the joints of the bracing, and rivetted on the top flanges of the adjoining girders, there is a cover-plate 3 feet by 1 foot by ⅜ inch. Each division of the wrought-iron bracing extends between the standard centres, the flange-irons of which are made in one length without joint. The lower flanges are also secured to the cap of the cast-iron columns by six ¾-inch diameter bolts at each end of a section, being 12 bolts to each column.

Under the base of each column there are four holding-down bolts, each 11 feet 2 inches long, exclusive of head and nut, and 2¼ inches in diameter, built in with the concrete and brickwork of the tank-piers, and secured to four horizontal wrought-iron anchor-plates ⅝ inch thick and 1 foot wide, two of them being 6 feet 6 inches, and two 4 feet long, crossing each other at right angles at corners, built in at a level of 10 feet below the coping level. The nuts, heads, and washers of the bolts are as shown in the details.

The cap to the standards is 4 feet 6 inches high, and 3 feet by 2 feet square, cast in a separate piece of ⅝-inch metal, and secured by ¾-inch diameter bolts. The finial is 5 feet high above the cap, and is of ⅝-inch metal, as per detail, being secured by four ¾-inch diameter bolts to the cap.

SUNDAY LABOUR IN GAS-WORKS.

By THEOBALD FORSTALL,

General Superintendent of the New Orleans Gaslight Company.

I have read with much surprise, in the *Journal** of July 16, the objections urged against the cessation of Sunday labour in gas-works by some of the Gaslight Association.

The best proof of the fallacy of these arguments is found in the fact that in many gas-works, both in Great Britain and the United States, no Sunday work is performed. I can assert for one of these institutions, in which it has been my privilege to introduce this principle, that after an experience of its results during 15 months, there is no desire on the part either of stokers or manager to return to Sunday labour.

The statement that in one gas-works in England the men themselves petitioned for a resumption of labour proves either that their wages for six days were insufficient to support their families, or that they were so brutalized by their previous treadmill life that they had lost the sense of everything outside of it. In the former case it is a good argument for higher wages; in the latter it supplies the best possible reason in favour of the system which it is brought forward to condemn.

We are solicitous of the condition of a clay retort, and exert much ingenuity to increase its efficiency and lengthen its life, because it is costly to replace; but we exhaust the vital powers of the stoker week after week, leaving him a total wreck in a few years, because he can be replaced without expense. Such, at least, is the only apparent explanation of the general indifference manifested to the improvement of the stoker's lot.

A little reflection will, however, show that, although the continuous wear and tear of the stoker's physical constitution, and the consequent depreciation in the quantity and quality of his work from year to year, does not appear in the "statement of results" as a special factor in the "cost of gas in holders," but is lost in the yield "per ton" or "per retort," it is there, nevertheless, and should be eliminated or reduced to the lowest point. Experience teaches that a man will do more and better work in the six than in the seven days of the week in the long run; and, reasoning merely from this physical standpoint, without reference to moral grounds, the human stoker, as a working animal, and in the interest of his employers, should be made to rest one day every week, as does the horse or ox.

I could give some interesting facts bearing upon this subject from the experience in our retort-house, but as Mr. Walker has agreed to read a paper on this question before the next meeting of the association, I am unwilling to forestall him in the points which he will undoubtedly present from his own experience. I may properly, however, mention a few results which may be of interest to him.

1. There is no accumulation of clinker in the furnaces on Monday morning, as asserted. The dampers and ash-pans being closed, very little fuel is required to keep up the heats.

2. The three or four men drawn by lot to look after the fires on Sunday often pay a bonus of one dollar each, besides the wages, to volunteers who will assume the task for the day.

3. Not a single case of drunkenness from Sunday recreation has occurred, and this was the difficulty I had apprehended most before adopting the system.

4. Extraordinary storeage room for gas is not essential. In many gas-works, in winter, charges are missed on Mondays, because of an accumulation of stock from the smaller consumption of Sunday; and to gas managers who believe in always keeping on a number of retorts, sufficient to render them independent of the weather, the Sunday suspension of make becomes a positive relief.

It remains to be said that the above statements refer to the New Orleans Gas-Works, in which Sunday work (from 5 a.m. to 5 p.m.) ceased on April 20, 1873. The daily production in December last ranged from 1 million to 1,000,100 cubic feet. There was the usual succession of dark days throughout the winter, and the greatest number of retorts under fire during the season was but ten more than for the corresponding production of the previous winter, while the manufacture proceeded uninterruptedly every day.

* *American Gaslight Journal.*

KILMARNOCK CORPORATION GAS-WORKS.

The following report and balance-sheet for the year ending June 13, 1874, has been submitted to the Town Council, and approved:—

"Your committee have to report that the alterations and enlargement of the purifiers, as agreed upon by the council at June 16, 1873, were completed in December last, at a cost of £966 16s. 9d. Of this sum, £500 has been taken from capital, and the balance, £466 16s. 9d., from revenue. There was also a scrubber erected, at a cost of £150 3s. 5d., which will add in future to the yield of ammonia, and materially improve the action of the purifiers. After the most careful consideration, your committee did not think it advisable to apply to the Board of Trade for powers, under the Gas and Water Facilities Act, to increase the gas-rates, as, after having made a trial balance at Dec. 31, and carefully considered the various items of expenditure, it was thought that the income would so nearly meet the expenditure that they should not incur the expense of making the application.

"The books were closed on the 13th of June, and are now in the hands of the auditor. After paying interest on mortgage debentures, bonds, and other charges, your committee find that there is a loss on the year's transactions, arising from the great increase in the cost of cannel coal and in wages, of £688 11s. 4d.; but as there was £466 16s. 9d. of extraordinary expenditure for the purifiers—of which future years will receive the benefit—the net loss is really only £221 14s. 7d.

"The consumption of gas during last year has increased 13¾ per cent. over the season of 1872 and 1873, the relative quantities being—1873, 29,247,200 feet; and 1874, 33,302,000 feet. The average illuminating power during the winter months was 27·9 candles. Owing to the high price of materials and labour, your committee thought it advisable to delay for a time laying the 9-inch main-pipe down Langland's Brae to the George Hotel, as recommended last year.

"Your committee anticipate that the balance of 1874 and 1875 will be more favourable, as the contracts for coal now made are considerably less per ton than those of 1873-4. There is still a balance of £603 15s. 3d. unexhausted, at the credit of profit and loss account, which will be carried forward to next year. The sinking-fund for the redemption of mortgage debentures comes into operation on the 31st of October next, the rate being 1 per cent. on the capital.

"An abstract statement of accounts is appended, subject to official audit, and also a tabular statement, compiled by Mr. Dalziel, the manager, showing various details in reference to the gas-works for a series of years past."

Dr. *Profit and Loss Account, June 13, 1874.* *Cr.*

	1873.	1874.		1873.		1874.	
To Coals used	3730 tons	4377 tons		£3,640 13 4		£6,248 13 1	
Dross coal				176 7 9½		0 4 0	
Wages				857 9 5		1,136 5 2	
Salaries				402 9 0		485 0 1	
Lime used				240 6 10		280 10 7	
Meters				146 0 10		48 8 10	
Carriages				87 5 7		49 16 6	
Charges—rates, taxes, &c.				286 14 8		301 12 0	
Repairs				378 18 2		363 19 11½	
Interest—mortgage debentures				1,731 5 5		—	
Mortgage bonds				177 15 0		—	
Royal Bank				13 5 3		—	
Feus				18 5 8		43 18 3	
Stationery				34 0 11		23 8 3	
Chemical work—expended				309 19 10		345 12 3	
Purifiers						466 16 9	
Retorts						81 1 4	
				£11,795 12 8½			
By Gas sold by meter—cu. ft.		29,247,200	33,302,000		£7,931 11 7½		£9,198 10 6
Ditto, contract consumers					452 7 6		517 16 8
Meter rents					461 17 1		469 13 6
Char sold					28 12 6		31 9 2
Chemical work—receipts					799 7 4		787 8 10
Rents					17 13 0		17 13 0
Old lime					47 1 5		55 8 10
Coals—surplus							29 0 10½
Balance							688 11 4
							£11,795 12 8½

Balance-Sheet, June 13, 1874.

To Gas-works, expended to date*	£42,465 16 10	By Mortgage debentures	£38,950 0 0
Pipes, ditto	121 19 9	Ditto bonds	4,500 0 0
Meters, ditto	46 18 6	Profit and loss, last year	£1,292 6 7
Purifiers and washer, ditto	650 3 5	Ditto, less above	688 11 4
Hydraulic main, ditto	24 13 9		603 15 3
Coals, on hand	389 13 9	Royal Bank	546 13 11
Lime, ditto	3 0 0		
Meters, ditto	145 10 0		
Materials for repairs, ditto	52 4 9		
Chemical work, ditto—materials	61 7 9		
Char, ditto	1 12 0		
Pipes, ditto	159 5 3		
Purifiers, materials (pipes), ditto	23 8 0		
Gas consumers, No. 1—outstanding	30 3 9½		
Meters A, ditto	3 1 0		
Gas consumers, No. 2, ditto	209 13 6½		
Meters B, ditto	49 8 6		
Cash, in hand	52 10 1		
Sundry accounts due, corporation	109 18 6		
	£44,600 9 2		£44,600 9 2

* A sum of £800 to account of cost of Municipal Extension Act is still payable.

Comparative Statement of the Cost of Production of Gas for Fourteen Years ending June, 1874.

Year ending June 14.	Coal. Tons Used.	Coals. Gross Value.	Millions of Feet Sold.	Average Feet of Gas Sold per Ton.	Average Cost of One Ton of Coal.	Cost of Carbonizing One Ton of Coal. Wages.	Salaries.	Lime.	Charges.	Repairs.	Total.	Average Cost of 1000 Feet. Coals.	Cost of Producing 1000 Ft. Gas. Wages.	Salaries.	Lime.	Charges.	Repairs.	Total.	Men's Wages. Labourers	Firemen.	Lime p. Ton. Irish.	Scotch.	Coal per Ton.
		£ s. d.			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.	d.	d.	d.	s. d.	s. d.	s. d.	s. d.	1861 to 1867.
1861	2094	1546 17 1½	18,417,000	8795	14 9½	4 11	4 4	0 11¼	2 2½	7 0	19 4½	1 8	6½	5½	1¼	2⅜	9½	2 1½	14 0	21 0	14 0	8 6	25s. 6d. Lesmahagow
1862	2117	1450 3 5½	18,671,000	8819	13 8½	4 5½	4 5½	0 9½	2 2	6 0½	17 0½	1 6½	6	6	1	2⅜	8	1 11½	14 0	21 0	14 0	8 6	15s. No. 1 Muirkirk
1863	2022	1469 15 7	18,711,900	9254	14 6½	4 8½	4 8½	0 10½	2 2	4 9½	17 3	1 6½	6	6	1	2⅜	6½	1 10	14 0	21 0	14 0	8 6	11s. No. 2 Muirkirk
1864	2067	1484 7 1½	19,540,100	9453	14 4½	4 8½	4 6½	0 9½	1 10½	4 1	16 0½	1 6½	5⅜	5⅜	1	2⅜	5⅜	1 8	14 0	21 0	14 0	8 6	10s. 3d. Lanemark
1865	2103	1626 18 10½	20,481,800	9469	15 0½	4 8	4 5½	0 11½	1 9½	4 4½	16 3	1 7	5⅜	5⅜	1	2⅜	5⅜	1 8	14 0	21 0	14 0	8 6	8s. Pathhead
1866	2457	1802 19 3½	22,327,600	9087	14 8	4 9½	3 11½	1 3½	2 2½	3 1	15 3½	1 7½	6½	5½	1½	2⅜	4	1 7½	14 0	21 0	14 0	8 6	5s. 6d. Splints
1867	2830	2070 19 10½	23,744,700	8390	14 7½	5 0	3 3½	1 2	2 0½	1 8½	13 2	1 8½	7	4½	1½	2⅜	2½	1 6	14 0	21 0	14 0	8 6	7s. Bartonholm.
																							1867 to 1872.
1868	2879	2294 13 8½	23,644,800	8212	15 11½	5 0	3 3⅜	1 1⅞	1 11⅞	2 5	13 10½	1 11½	7½	4⅞	1½	2⅜	3½	1 7½	14 0	21 0	14 0	8 6	28s. Lesmahagow
1869	2983	2936 16 5½	23,890,000	8008	15 0	4 7½	3 3	1 6	1 9½	3 5	14 6½	1 10½	6½	4½	2½	2⅜	5	1 9½	14 0	21 0	14 0	8 6	20s. No. 1 Muirkirk
1870	3203	2089 13 9	23,882,800	7456	13 0½	4 3½	3 2½	1 1	1 11½	1 5⅜	12 0	1 9	6½	5	1⅜	3	2½	1 6½	14 0	22 6	14 0	8 6	15s. No. 2 Muirkirk
1871	3576	2287 8 11	26,250,300	7340	12 9½	4 1	2 9½	1 3	1 8½	2 4½	12 2½	1 8⅜	6½	4½	2	3	3½	1 7⅜	15 0	23 6	14 0	8 6	12s. 6d. Lanemark
1872	3728	2406 9 3	27,952,000	7497	12 10½	4 7½	2 7⅞	1 4	1 9¾	1 11	12 4	1 8⅝	7⅞	4¾	2¼	3	3	1 7⅜	17 0	25 6	14 0	8 6	9s. Pathhead
																							1873.
1873	3730	3640 13 4	29,247,200	7841	19 6½	4 7½	2 2	1 3½	1 6½	2 0½	11 7½	2 5⅝	7	3½	2	2½	3	1 5½	18 0	28 0	20 0	14 0	38s. 6d. Lesmahagow 26s.6d.No.1 Muirkirk 20s. 6d. Lanemark 16s. 6d. Pathhead
																							1874.
1874	4377	6248 13 1	33,302,000	7608	28 6½	5 2½	2 2½	1 3¼	1 4½	1 8	11 8½	3 9	8¼	3½	2	2½	2½	1 6½	21 0	31 6	20 0	14 0	45s. Lesmahagow 42s.6d.No.1 Muirkirk 36s.6d.No.2 Muirkirk 30s. Lanemark 18s. 6d. Bartonholm 18s. Splints.

PROPAGATION OF PRESSURE AND FLOW OF WATER IN LONG TUBES.

A lead pipe 3000 mètres long and 7 m.m. wide, which M. Oskar Mayer had obtained for some other experiments, afforded a good opportunity for making observations on an extensive scale, on the propagation of pressure and flow of water in cylindrical tubes. The entire length of pipe was made up of 12 rolls, each of 250 mètres in length. At either end was a force-pump, by which the pipe could be filled with water. The air was allowed to escape through fine holes at the highest point, which were afterwards closed. Further, one end of the pipe was connected with a mercury manometer, the scale of which reached to 5 atmospheres pressure.

"In a first observation made with this apparatus, I determined the velocity with which pressure was propagated through the entire length of the pipe. According to the principles of the wave theory, it cannot be doubted that the velocity with which a single impulse of pressure is propagated must be no other than that with which a series of impulses in slow or quick succession is propagated; that is, no other than the velocity of sound.

"The velocity of sound in water (unconfined) is, in round numbers, 1400 mètres in a second. Wertheim, however, has shown from observation of the tones given by pipes filled with water, that in narrow tubes the velocity is considerably smaller; it only reached 1100 to 1200 mètres in his experiments. Considering that in the narrow pipe now used the motion must be still more retarded through friction, the velocity of sound in it could not be expected to be more than about 1000 mètres in a second; so that the entire length of tube would be traversed in three seconds.

"This expectation was quite verified in experiment. A sudden pressure of the piston of the pump at one end of the tube produced an effect in the manometer at the other end in exactly three seconds.

"In a long series of observations I investigated the laws of the velocity with which water flowed through this long and comparatively narrow tube.

"Of the law governing the flow of water through cylindrical tubes, we have exhaustive knowledge only for the particular case in which the tube is very narrow, a capillary tube, and one of considerable length. This has been studied experimentally by Poiseuille, G. Hagen, H. Jacobson, and others.

"For the case of water-flow through wide tubes, interpolation formulæ have in general been constructed. Only two recent works, one by G. Hagen, the other by C. J. H. Lampe, have aimed at reducing the more complicated laws for wide tubes to the simple form of the law for capillary tubes. Hagen has perfectly succeeded in proving that the same formulæ, through which he represented his own experiments with capillary tube, also include the law of the measurements made by Darcy on wide tubes.

"With still greater probability might I anticipate a good agreement with Poiseuille's law, in observations with a narrow tube only 7 m.m. diameter. The apparatus was so far altered, that the pipe was cut off before one of the force-pumps previously used; the pump at the other end, however, and the manometer beside it being retained. By quick and short motion of the handle

of this pump, the mercury in the manometer could be maintained nearly in the same position, while, at the other and open end of the pipe, the water flowed out by a regular velocity. The time was observed in which half a litre of water flowed out through the 3000 mètres pipe, and this was repeated with varying pressures of the manometer. The temperature of the water was about 96° C.

"Two days later the same experiments were made with shorter portions of the pipe, which was cut through for the purpose. The temperature of the water was 11° C."

The values obtained were utilized for construction of a formula for the flow of water, and they led to the result that Poiseuille's law holds good for outflow of water, not only through capillary tubes, but also through wider, where these are sufficiently long. It was found confirmed for a tube 7 m.m. wide, and 2500 to 3000 mètres long. A correction, however, was required.—*Poggendorff's Annalen, Jubelband.*—(Translated in *Chemical News.*)

AMERICAN WATER GAS RESEARCHES.

A Report by Professors WURTZ and SILLIMAN.

[From the *American Gaslight Journal.*]

I.

THE PROBLEM STATED.

The Gwynne-Harris process claims to be a successful solution of a problem in the practical chemisty of gas-making, which has been attempted before during the past 30 or 40 years*—viz., so as to employ the non-illuminating but combustible gases produced from the decomposition of water by contact of its vapour with red-hot carbon, as to give to them, when united with the gases and other carbo-hydrogens obtained from bituminous coal or other hydrocarbons, an average illuminating power and permanency which shall make the joint produce an equivalent in illuminating power to the best coal gas, while securing also from the same materials a largely increased volume of gas at a nominal increase in cost; or, what is the same thing, to obtain a given volume of gas of a certain candle power, at an important reduction of cost.

PECULIAR FEATURES OF THE GWYNNE-HARRIS METHOD OF PRODUCING THE HYDROCARBON GAS.

The Gwynne-Harris method of making the hydrocarbon gas embraces the following essential and peculiar features:—

1. The use of clay retorts in place of those of iron, for the decomposition of the superheated steam.

2. The manner of drying and superheating the steam, by the use of superheaters of clay set in the hotter parts of the bench, thus securing a perfect conversion of every particle of watery vapour into superheated steam of very high temperature before it enters the anthracite retort.

3. The mode of distributing the superheated steam in the anthracite retort by means of a false or cellular bottom, formed of perforated tiles; securing the flow of the superheated steam, in a regulated manner, from below upwards, by numerous small openings through the highly heated anthracite. By this disposition of the process the decomposition goes on regularly, and with results as nearly uniform as possible.†

4. The manner of conducting the mixed gases from the decomposition of the superheated steam into bituminous coal retorts, so as to secure the regular and uniform admixture of the hydrogen and carbonic oxide gases with the products of the bituminous coal distillation; thus producing an illuminating gas of uniform composition and permanent character.

The importance of these last two features in the hydrocarbon process will be better understood if we revert to the difficulties which 15 years ago were encountered by the projectors of White's form of the process in England, from the want of any available method, then known, of regulating the uniform production of the water gas and its admixture with the illuminating gases from bituminous coal. At the conclusion of a series of five days experiments on White's process, Mr. T. G. Barlow sums up as follows (London JOURNAL OF GAS LIGHTING, July 10, 1854, p. 475): "The experiments herein recorded are, in my opinion, conclusive in favour of the soundness of the hydrocarbon theory; but considerable difficulty exists in its practical application on an extensive scale, from the following amongst other causes:—

"1. The uncertainty in the rate of its production, arising from the difficulty of maintaining the water retorts at a sufficiently elevated temperature to ensure the uniform decomposition of the steam.

"2. The large quantity of carbonic acid produced in proportion to the combustible gases.

"3. The difficulty of maintaining the proper proportion between the water gas and the cannel gas, so as to produce uniformity in the quality of the combined gases."

It suffices to say here that at the conclusion of our five months operations on a working scale with the American improvements in the hydrocarbon process, all these difficulties have disappeared; and we may add with truth that the following propositions by Mr. Barlow, which he propounds as conditions essential to the successful conduct of the hydrocarbon process on a large scale, have been fully realized in our Fair Haven experiments, viz.:—

"1. That the temperature of the water retorts (our anthracite retorts) shall be maintained at 1500° or upwards, with an expenditure of no more than 60 lbs. of fuel per 1000 feet of water gas produced.

"2. That the greater portion of the carbonic acid produced shall be converted into carbonic oxide, before its admission into the cannel retort.

"3. That the water gases shall be supplied to the cannel retort in such proportions as to produce uniformity in the quality of the combined gases."—London JOURNAL OF GAS LIGHTING, July, 1854, p. 477.)

An examination of the analytical results in this respect will show that the average content of the unpurified water gas in carbonic acid does not exceed 10 per cent., and when the retorts are kept at a proper temperature, this is as low as 3 per cent.; while in no case has the smallest trace of carbonic acid been detected in the purified gas. Moreover, the expenditure of fuel to the 1000 cubic feet of water gas is very much less than £60. (See the section on the cost of making gas by the Gwynne-Harris method for details.)

SIMPLICITY OF THE MANAGEMENT OF THE APPARATUS.

The arrangement and practical management of the Gwynne-Harris hydrocarbon process, in its details of daily operation, are characterized by a remarkable simplicity which is much in favour of its success. It can be easily applied to any existing coal gas retort-house, without any important or costly changes of construction, and without interruption in the regular supply of gas. No addition to the skilled labour in use in every well-regulated gas-house is required. The manipulation of the wheel-cocks by which the flow of steam is regulated to each bench, is acquired without difficulty by the fireman, who soon learn to judge exactly of the proper action of the anthracite retort, by the degree of force with which the volume of mingled hydrogen and carbonic oxide issues from the connecting-pipes when the lids are removed from the bituminous coal retorts in the charging. All practical gas men and managers who have witnessed the facility and certainty of this part of the process, have expressed both surprise and satisfaction at the ease with which the difficulties connected with the introduction of the steam, its regular decomposition, and the steady outflow and control of the resulting gases, have been overcome in this form of apparatus.

OBJECTS OF, AND MODE OF CONDUCTING, THE RESEARCH.

The object of this research upon the new form of hydrocarbon process has been to test the merits of the method as developed by its practical working on a sufficiently large scale, and with various kinds of coals, and to give the whole subject generally such investigation as its general practical importance demands. To do this satisfactorily, it was essential that a considerable amount of analytical work should be undertaken in connexion with the processes of manufacture. Some interesting points of equal practical and theoretical importance could be reached in no other way. And it is believed by us that the examination of the results stated in this paper will show that the solution of these questions has proved of unexpected interest and importance, going far, it is believed, towards settling the moot questions involved.

In order to obtain results which would satisfy gas engineers, it was important to have control of some gas-works, where the experiments essential to testing all the points at issue might be carried out on a working scale, without the disturbing influences which are inseparable from the conduct of such an investigation, when made in connexion with any active gas-works where the ordinary coal gas process is in use at the same time. Arrangements were therefore made with the New Haven Gaslight Company for the exclusive use of a small work of four benches, owned by them in the suburb of Fair Haven. These works had lain idle for some time, had been but little used, and were designed to produce about 40,000 cubic feet of gas daily. The gasholder has about that capacity, and the general plan of the works is such as is usual for dry lime purification. A photometric room was arranged near the station-meter, and a gas laboratory fitted up with all the needful apparatus on the premises. The necessary changes to convert the works into the form required for your plans were commenced in July, 1868, under the supervision of your superintendent, Mr. G. W. Harris, one of the inventors. Unexpected mechanical difficulties, arising mainly from the disuse of the works for a considerable period, caused much delay in the development of the process, and it was only in November that Mr. Harris was prepared to turn the works over to us for experimental purposes.

[Since the 1st of December all the operations and records have been under my supervision, and have remained so until the end of March. About the 1st of December the valuable services of Professor Henry Würtz, of New York, a well-known chemist, and familiar with gas-making, were secured, and I desire here to acknowledge my great obligations for the efficiency, zeal, and ingenuity which his long experience in such matters enabled him to bring to bear on this research.—B. SILLIMAN.]

ARRANGEMENT OF THE APPARATUS.

Two benches of three clay retorts each were prepared. The upper retort, charged with 860 lbs. of Pennsylvania anthracite, was 9 feet long by 30 inches wide, and 16 inches high. After inserting the cellular bottom for distribution of the superheated steam, these dimensions were contracted to 27 by 13 inches.

The bituminous coal charges were from 200 to 250 pounds to each bituminous retort, of such coals as are subsequently specified.

On very rich coals, like Boghead, Albert, Peytona, and other cannel coals, the charges were reduced to 100 pounds, or even less.

The hydrocarbon gases (hydrogen and carbonic oxide) were allowed to flow for two hours upon each fresh bituminous charge, alternately from one retort to the other. The whole period of carbonization was within four hours, and was often with advantage reduced to three and a half hours, and for very rich cannels to less.

With a view to determine the best mode of admitting the hydrocarbon gases to the bituminous coal retorts, one bench was so arranged that these gases might be sent at pleasure in three ways, viz.:—

1. Through the bituminous coal retort, and back through a top flue constructed over the retort to the stand-pipes.*

2. Through the top flue just named into the rear end of the retort containing the bituminous coals, and then up through the mouthpiece.

3. Directly into the mouthpiece, where a commingling of the hydrocarbon gas with the bituminous coal distillate occurred, and thence through the stand-pipes to the hydraulic main.

It was also possible, of course, to employ either bench at pleasure in the ordinary dry method of carbonizing.

All three of these methods of management of the products of decomposition have been tested by a variety of experiments, the details of which need not be given here; but, practically, nearly all the working results detailed in this report were obtained by the third method named above. This method appears to secure most of the substantial advantages sought. The hot gases of the anthracite retorts seize upon and exalt to a permanent gaseous condition an amount of hydrocarbon vapours sufficient to give to the resulting product the

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* For an outline of previous researches and experiments in this direction, those who are not familiar with the literature of the subject are referred to the supplement to Ure's "Dictionary" (Appleton's edition), article "Coal Gas," or to Ronalds and Richardson's "Chemical Technology" (2nd edition, London, 1855, p. 625). For fuller details, reference may be had to the original papers of Dr. Frankland, Mr. Barlow, Dr. Fyfe, and others, in the first four volumes of the London JOURNAL OF GAS LIGHTING. The 2nd edition of Clegg's "Treatise on Gas Lighting" (1853), pp. 148-169, also contains a summary of the methods of hydrocarbon gas-making in use in England under White's patent, with figures of the apparatus employed, which, in the light of our present experience, is calculated to provoke a smile. In fact, on looking back from our present standpoint to the process as it then existed, its failure seems a most natural and inevitable result of the very imperfect apparatus employed. This failure excites neither surprise nor apprehension of its recurrence; success under the experimental conditions then adopted was impossible for several important reasons, which will appear from a perusal of this report. Perhaps no better illustration of the state of mind of the most eminent gas engineers, and of the state of the art also, can be found than is exhibited in the following remark of T. G. Barlow, Esq., one of the best of English engineers, and the eminent editor of the London JOURNAL OF GAS LIGHTING. In his JOURNAL for June 10, 1852, while reviewing Mr. Clegg's estimates of the cost of this process, speaking of wear and tear, he says (p. 350): "He (Mr. Clegg) is, perhaps, speculating upon the use of clay retorts in the manufacture of water gas; but he will soon find, as others have done who have already tried the experiment, that their porous nature renders them totally inapplicable to the retention of such gases as are obtained by the decomposition of water and" (qy. *by*) "carbon. Metal retorts must consequently be used," &c. We now know that clay retorts are the only retorts which can be successfully used in the hydrocarbon process. Mr. Barlow's remark was probably predicated upon the idea, then common, of the low density of the gases produced by decomposing watery vapour by hot carbon; which a little reflection would have removed. The fact is, the mixed gases from this decomposition, even when most free from carbonic acid, have a considerably greater density than coal gas, ranging from 463° to 488°, and, moreover, often by this method contain but little more hydrogen than the average quantity found in coal gas. This notion, that clay retorts could not be sucessfully used in the hydrocarbon process, has retarded the general introduction of the method by many years, and has been first successfully overturned by our American inventors.

† It is both curious and instructive in this connexion to read the remarks of Clegg (2nd edition) on the comparative advantages of introducting water or steam into the carbon retorts. Since 1852 the employing of exhausters requiring the use of a steam-engine has become all but universal in gas-works, and the difficulties supposed by Clegg to stand in the way of the use of steam are not only purely imaginary, but we are at a loss to understand how a practical engineer could have entertained them for a moment. Another remark by Clegg, prefatory to his notice of the hydrocarbon process, is characterized by great sagacity. He says (p. 148): "The present arrangement of the apparatus for this process is defective in some points of detail, especially in the water retorts. This is incidental to all new manufactures; and, as the theory of the hydrocarbon process is undoubtedly correct, there can be little doubt that ultimately such modifications will be introduced as will render the manufacture as certain as that of ordinary gas-making." This prediction appears now to be fully confirmed by our working results on what we may with propriety call the American plan.

* This form of retort involves the essential features of the so-called "diaphragm retort" of White's process, often mentioned by Dr. Frankland. But experience has convinced us that it may with advantage be replaced by the ordinary simple form of clay retort, and if a separate hydrogen flue is required, there is a much simpler way of obtaining it, which we have indicated to the inventors.

same illuminating power which belongs to the bituminous mixture employed when carbonized in the dry way under the most favourable circumstances; and the volume of the total product is increased by the addition of an amount equal to an increase of 50 per cent. of the volume. Thus, a ton of Westmoreland coal, with 10 per cent. of Albertite added as an enriching material, which carbonized dry yields an average of 4·10 to 4·20 cubic feet—or say, 9200 to 9400 feet per ton of 18 to 20 candle gas, yields, by this treatment, 14,200 cubic feet of gas of the same candle power. (See the tables at close of this document for details.) This is equivalent to over 19,000 cubic feet of 15-candle gas, the usual standard of illumination in most American cities.

When the arrangement of retorts is, as it was at Fair Haven, in benches of *threes*, and the upper one is the anthracite retort, the amount of water gas produced is sufficient to raise the product of the whole bench to 15,000 or 18,000 cubic feet in 24 hours, which, allowing 5000 feet as the product of each bituminous coal retort on a four hours shift, leaves at least 7000 feet for the joint product of the decomposition of water and vaporization of the hydrocarbon vapours, which would otherwise find their way into the coal tar. The measured quantity of tar by this process is as nearly as possible 9 gallons per ton of coals carbonized, while the same coals carbonized dry yield somewhat over 11 gallons, leaving a little over 2 gallons per ton as the quantity which is permanently vaporized to form part of the perfected gas.

The coke produced when the bench is managed as now described is quite sufficient to burn off the charges when good caking coals are used, and in a large work would leave a small surplus.*

With the exclusive use of cannel coals, producing no coke, or that of little value, and requiring a large volume of water gas to bring them down to the comman standard of illumination, coke must, of course, be supplied from some other source. So long, therefore, as the volume of gas sought to be produced does not require more than *one-third* the number of retorts heated to furnish the hydrogen, the amount of coke produced will more than suffice to heat the benches.

Our experiments at Fair Haven, in the large way, were restricted chiefly to the class of caking coals, with different enriching materials added in proportion of 5 per cent. to 20 per cent. of the mass, for the reason that in the United States the comparatively high cost of good gas coals renders it important to the manufacturer to produce as much gas as possible from a given weight of coal, consistent with maintaining the standard of illuminating power. This standard is usually 16 candles, more rarely it is 18 to 20 candles, quite as often it is 14 to 15 candles. All gas engineers will agree that it is a very good caking coal which, with a 16-candle power, and *used alone*, will furnish an average of 10,000 cubic feet of purified gas. It is certain that very few ever reach these figures, and with 10,000 feet to the ton, the illuminating power rarely exceeds 15 candles. That few gas-works attain this standard even, during the whole year, few will deny who are competent to express an opinion. We have, therefore, thought it best to guide our researches, in view of the great practical importance of obtaining a yield of 15,000 cubic feet of 16 to 18 candle gas, using coals universally recognized as the best available to American gas engineers, and employing in connexion with them very moderate quantities of such enriching materials as are within the reach of all. The results are given in detail in the records appended, and to which more particular attention will be directed hereafter.

At the same time some attention has been given to the use of the rich cannels, and especially to the Peytona of West Virginia, which is certainly one of the best American cannel coals known, yielding over 10,000 cubic feet of 42-candle gas to the ton, and 13,200 cubic feet of 32·66 candles, by ordinary treatment. By the hydrocarbon process an average of 22,400 cubic feet of 23·25-candle power, and a net gain of 124 per cent. of total economical effect, was obtained from this coal. (See Table II., for details.) This coal is one of several of similar character found in Western Virginia, but appears to be much the best which has yet been opened.

The photometric measurements were made daily on the gas in the holder, after the lime purification, by Bunsen's photometer, with all the usual precautions and corrections.

For the rich cannel coals with charges of 100 pounds each, the method pursued was to test the gas for photometric power at the end of the first hour, after the amount of the charge, and when rather over one-half the total yield had been registered; in these cases the gas was drawn, of course, from the main, after it had passed the station-meter, and was on its way to the holder. Such tests, extending for 15 or 20 minutes beyond the first hour, gave in general closely accordant results, and, in point of illuminating power, are certainly *not above* the average yield of the charge.

The eudiometrical analyses were made—

1. Upon the products of the anthracite retorts, drawn from an outlet in the mouthpiece before these gases mingled with the products from the bituminous coal retorts.

2. On the purified and perfected gas from the holder.

3. On the gas from the New Haven Gaslight Company, made from identical materials during the periods of comparison.

The experimental details and modifications of the usual methods of gas analysis which have been employed in these investigations are reserved for a separate memoir, to be published ere long in the scientific journals. In this connexion such details are out of place, being of interest chiefly to analytical chemists.

(To be continued.)

Schemes of Sewerage.—The Slough Local Board have presented a memorial to the Local Government Board, in which they set forth their difficulties as regards the disposal of the sewage of the district, in consequence of the Thames Conservancy Act having deprived the district of the natural outlet which was previously available. They are desirous that it should devolve on the engineering inspectors of the Local Government Board to determine the scheme of sewerage that should be adopted for the district, it being merely left to the sanitary authority to carry it out. In their memorial, they state as follows:—"Having regard to the present procedure by which a qualified inspector now holds inquiries, consuming much time and involving heavy expense, and often resulting only in successive condemnation of sites and schemes successively chosen, and thereby proving the powerlessness of the sanitary authority to deal with the evil with that promptness and success which its nature demands, it seems to your memorialists most important that such inspectors should be empowered to take action in the first instance, in determining which is a proper and suitable site and scheme, leaving to the sanitary authorities the duty of carrying them out; and that sufficient legislative power should be obtained for that purpose, whereby your memorialists, and all other sanitary authorities similarly situated, would be enabled promptly to carry out those measures of sanitary reform which the health of their several districts, as well as of the country at large, demand. Your memorialists are led to the foregoing conclusion by the consideration that inasmuch as the sewage of any given district must be disposed of in one way or another, the inquiry of an inspector should be directed, not so much to the intrinsic merits of any particular given site or scheme, as to the relative or comparative merits of all the sites or schemes available for the district requiring attention; and therefore that all available sites and schemes should be brought under his notice and deliberation before he shall be required to decide as to any one of them." The Slough Local Board ask for the co-operation of other sanitary authorities in supporting this view.—*Local Government Chronicle.*

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* See the chapter on the cost of gas by the hydrocarbon process, p. 61, for further details on this point.

PRICE OF GAS IN AMERICA.

The following information respecting the net price of gas in the United States has been recently published in the *Scientific American*. The dollars are converted into English currency at the exchange rate of 4s.:—

UNITED STATES.

	Dollars.'		s.	d.
1. Maine	3·87	..	15	5·70
2. New Hampshire	3·96	..	15	10·08
3. Vermont	4·80	..	19	2·40
4. Massachusetts	3·86	..	15	5·28
5. Rhode Island	3·35	..	13	4·80
6. Connecticut	4·03	..	16	1·44
7. New York	3·88	..	15	6·24
8. New Jersey	3·80	..	15	2·40
9. Pennsylvania	3·46	..	13	10·08
10. Delaware	3·95	..	15	9·60
11. Maryland	3·59	..	14	4·32
12. District of Columbia	3·16	..	12	7·68
13. Virginia	3·89	..	15	6·72
14. West Virginia	3·11	..	12	5·28
15. North Carolina	6·67	..	26	8·16
16. South Carolina	3·80	..	15	2·40
17. Georgia	5·07	..	20	3·36
18. Florida	8·00	..	32	0·00
19. Alabama	4·83	..	19	3·84
20. Mississippi	5·25	..	21	0·00
21. Michigan	3·43	..	13	8·64
22. Wisconsin	3·87	..	15	5·76
23. Ohio	3·32	..	13	3·36
24. Indiana	3·54	..	14	1·92
25. Illinois	3·87	..	15	5·76
26. Kentucky	3·92	..	15	8·16
27. Tennessee	4·06	..	16	2·88
28. Minnesota	4·31	..	17	2·88
29. Iowa	4·52	..	18	0·96
30. Missouri	3·95	..	15	9·60
31. Arkansas	5·00	..	20	0·00
32. Louisiana	4·50	..	18	0·00
33. Texas	5·75	..	23	0·00
34. Kansas	4·55	..	18	2·40
35. Colorado	5·00	..	20	0·00
36. Utah	4·00	..	16	0·00
37. California	6·11	..	24	5·28
Average net price of gas in the United States.	4·32½	..	17	3·36

The following are the prices paid by consumers in the cities and towns named:—

	Dollars.		s.	d.
Albany, United States	2·50	..	10	0
Baltimore "	2·75	..	11	0
Boston "	2·50	..	10	0
Chicago "	3·37	..	13	5·76
Cleveland "	2·50	..	10	0
Concord "	3·20	..	12	9·60
Harlem "	3·00	..	12	0
Lowell "	2·75	..	11	0
Manchester "	2·70	..	10	9·60
New York "	2·75	..	11	0
New Orleans "	3·00	..	12	0
Oswego "	3·50	..	14	0
Rochester "	3·50	..	14	0
St. Louis "	3·25	..	13	0
Syracuse "	3·25	..	13	0
Troy "	3·25	..	13	0
Washington "	3·56	..	14	2·88
Hamilton "	3·00	..	12	0
Kingston "	3·50	..	14	0
Canada—				
London	3·00	..	12	0
Montreal	2·66	..	10	4·80
Quebec	2·80	..	11	2·40
Toronto	2·50	..	10	0

Fatal Gas Explosion at Bristol.—An inquest was held on the 12th and 13th inst. by Mr. F. F. Cartwright, the deputy-coroner of Bristol, on the body of Geo. Henry Fudge, aged 20, a billiard-marker, who died at the Infirmary from injuries he received by an explosion of gas at the Rifle Club on the 1st inst. Mr. Woodrow, the manager of the club, was injured at the same time, and was unable to leave his bed; his depositions had, therefore, to be taken in his room. He stated that he was manager of the Rifle Club. On the morning of the 1st Mrs. Woodrow called his attention to an escape of gas in the house. He thereupon went with the deceased to find out where it was proceeding from. They had no light; they went into several rooms, and then came downstairs. In the officers room there was a very slight smell of gas. They went into the room opposite, but there was no escape there. They again went into the officers room, and witness lit a cigar, and sat down on the table, smoking. Deceased got upon the table, and said, "Let me have a match to find out where the escape comes from." The smell of gas was so slight in the room that he let him have the box of matches. He struck one, put it to the burner, and immediately witness saw a blue flame run up the lamp, and he recollected nothing more. He always went round the house to see if the gas was all right. There was so little smell in the room that he thought there was no danger, and no necessity for turning off the gas at the main. John Clark, a gas-fitter, said at the beginning of October he was requested to come to the club, where he was shown, in the officers room, a lamp, which he examined. He found the inner tube of the lamp defective. There was a hole in the pipe that caused the water that was in the upright of the pendant to go down in the body of the light. When there was no water the gas escaped. The pipe was acted upon by the gas, and the hole produced. If there had been more water put into the pipe there would be no escape, but the lamp would not light. This was the only escape he could find. The coroner, in summing-up, said there could be no doubt that the deceased died from the injuries he received by the explosion. It was a very unfortunate circumstance that the gas was not turned off at the main. The gas company issued to every consumer, on the bill, very plain and stringent directions in event of an escape of gas. The reason for these directions being disregarded was the slightness of the smell. Whenever there was a smell of gas these directions should be carried out as quickly as possible. They were in effect that whenever any considerable quantity of gas had escaped the cocks were to be turned off at the supply, and the windows and doors thrown open. He should rather leave out the word "considerable," and urge that the directions be used when any escape was perceived. He thought the jury would have no doubt that the death was caused purely by an accident, and that, though there might be some little degree of thoughtlessness, there was no actual blame attributable to any one. The jury returned a verdict of "Accidental death."

THE SEWAGE OF TOWNS.

By Mr. BALDWIN LATHAM, C.E.,

[A Paper read at the Social Science Congress at Glasgow, Oct. 1.]

Wherever persons congregate together, forming villages, towns, or cities, an artificial state of things arises which demands special measures to be taken for their convenience, comfort, and health. The larger the place and the more dense the population, the greater the necessity for immediately and completely removing all decomposing or polluting matter from it. It is rarely possible to obtain sufficient water for a large town without going to a considerable distance and to great expense for it, and when used for ordinary domestic purposes, whether it be culinary, household cleansing, or washing purposes, or the vehicle for carrying away the alvine discharges, or for any other purpose, artificial means must be adopted for conveying it away. Provision must, likewise, be made for the removal of the rain falling upon the site of the town, and some method must be adopted for the scavenging or removal of the more solid waste materials produced in more or less quantity in every town.

The best method of removing all decomposing matter from the site of a town must be admitted to be that which performs its work most efficiently, most conveniently, most expeditiously, is the least costly, and gives the best results in a sanitary point of view.

So far as the drainage of a town is concerned, it will be admitted that three things are necessary in order to secure the health of the inhabitants:—

1. The effectual drainage of the surface.
2. The drainage of the subsoil.
3. The means of conveying away the polluted water.

It is not now necessary to enter into such details as relate to a system of sewerage, as the expediency or not of constructing one or more sets of sewers to deal conjointly or separately with the sewage, rain, or subsoil water, but we will confine our attention to some matters in dispute at the present time as to which is the best method of conveying away the excreta and other noxious and decomposing matters from the sites of towns.

In approaching this question, in the opinion of the author, too much stress is at present laid on the agricultural rather than on the sanitary aspect of affairs. It is on this account chiefly that a variety of schemes have been proposed and put in practice for collecting the manurial element of the population, with a view, if possible, to realize a profit therefrom. In deciding such questions the authorities of towns should consider that there is more to be gained by a perfect system that shall preserve health and lessen the risk of death, than by any system, however remunerative, if there are good and sound sanitary objections to it.

Various dry methods of collection have been proposed, such as the "Eureka," or pail system, formerly adopted at Hyde, in Cheshire, now in use at Rochdale, Manchester, and other places; modifications of this system, as introduced by Goux and Morrell; the earth-closet system, earth being used as the means of deodorizing and fixing the manurial property in the fæcal matter. Carbon has of late been proposed and used as a substitute for earth, with similar mechanical appliances; and Captain Liernur's pneumatic system of collecting the fæcal matter.

Of all the dry methods, the pneumatic appears to be the most simple, cleanly, and expeditious, and approaches nearest to the water system in regard to receiving the alvine discharges in closets, and removing them through pipes by pneumatic action. In these respects, therefore, it is certainly a very great improvement on the "Eureka," or pail system, or the earth-closet system, both of which, but especially the former, necessitates the carrying backwards and forwards of pails of filthy and disgusting matter.

Experience has now amply demonstrated that neither the Eureka, the earth-closet, nor other dry systems can be considered remunerative, while all dry systems require the fæcal and other decomposing matter to be left in the midst of the populations producing it for a certain period, thus increasing the risk of producing or aggravating a certain type of disease. The promoters of the dry systems advocate them as a panacea for all the evil connected with the subject of town sewerage; but, unfortunately, not one of the dry systems that have been introduced can obviate the necessity of a system of drains and sewers in a town. Considering, therefore, that water is required to be brought into a town for a variety of purposes unconnected with the conveyance of the alvine discharges—that it is delivered under such pressure that, with properly constructed drains and sewers, it becomes the mechanical agent which will bear away innoxiously and harmlessly not only all fæcal discharges, but the refuse of wash-houses, slaughter-houses, and manufactories, which cannot otherwise be dealt with—it does appear, in the author's opinion, that, after incurring the expense of procuring water, and providing drains and sewers for conveying this water, after use, from the sites of towns, the most should be made of it, and that it is unnecessary and wasteful, after paying the cost of water which has the required mechanical power, to employ expensive auxiliary systems to remove the excreta and other matters by manual and horse labour, which can be more safely and expeditiously removed by water carriage. It is generally considered that a water-closet entails an increased cost in the shape of water. At first sight this appears a reasonable assumption, but experience has shown that, with proper appliances, no greater volume of water is needed for sanitary purposes in a water-closet town than is now found necessary in towns which have no such appliances. The following table of 10 water-closet towns, and 10 middenstead, or dry-system, towns, may be taken to show the result. The average volume of water used in the water-closet towns is 31·6 gallons per head, while the average volume used in middenstead towns is 35·7 gallons per head:—

Names of Water-Closet Towns.	Quantity per Head.
Alnwick and Canongate	30
Barnet	30
Croydon	56
Liverpool	26
London	29
Penzance	25
Plymouth	40
Uxbridge	20
Warwick	30
Watford	30
Average	31·6

Names of Middenstead Towns.	Quantity per Head.
Atherton	40
Ayr	38
Bradford	26
Bacup	33
Glasgow	50
Lincoln	30
Malton	40
Ormskirk	40
Perth	30
York	30
Average	35·7

In the case of water-closet towns, the largest quantity used—viz., 56 gallons per head, is at Croydon. This quantity is due to an error in the fittings, which was permitted when the works were first constructed. It has been amply demonstrated by practical experience in Croydon, that with proper appliances 15 gallons per head per day is sufficient water for all purposes, and this, too, in a district in which the number of water-closets greatly exceeds the number of houses, many houses being fitted with two or more water-closets.

One objection has been raised to the water-carriage system, and that is the difficulty of extracting or utilizing the whole of the fertilizing elements contained in sewage. When it is considered that up to the present time it cannot be shown that any profit has been made, but, on the contrary, a loss is incurred by removing the fæcal matter of towns by the dry or other systems, the cost of collection, manipulation, storeage, interest, and principal on capital employed more than absorb the intrinsic value of the article collected. It is of little importance through what channel the loss is incurred. In point of economy the water carriage will bear favourable comparison with any other system, and taking into account, what must not be ignored, that all water which has once subserved the uses of man should undergo some system of purification if it has again to be used, it will be seen that where the dry systems are in operation, in addition to the loss in collecting the fæcal matter, the impure water will require treatment almost equal to that necessary for sewage, containing the whole of the alvine discharges. In considering the question of the disposal of the sewage, either of water-closets or other towns, the analyses by the Rivers Pollution Commissioners show that, except a slight excess of organic nitrogen and carbon, the sewage of middenstead or dry system towns contains quite as much polluting matter as that of a water-closet town. In many towns that have a dry system of conservancy the sewage is really fouler than in a town that has a water-closet system. This is due in part to manufactories, and also to the fact that where dry conservancy is in operation, only a small proportion of the whole of the fæcal matter of the population is secured; the other portion, by some means or other, is lost, and eventually finds its way into the sewers.

The case as between dry conservancy and water-closets stands thus:—In every town in which a dry system of conservancy is used, the town authorities entail a large outlay in collecting, manipulating, and dealing with the fæcal matter as separate from the sewage proper. They do not escape having to deal with the polluted liquid at the outfall, which requires just as much care and treatment as if it contained the fæcal matter of the population, its chemical constituents being almost identical, and the polluting matter almost as great as in the case of a water-closet town. If, therefore, any process of treating the sewage of a water-closet town is unsuccessful, and entails an expense upon the constituency, it naturally follows that a double expense is incurred by those towns which adopt two systems, the sewer system, which is absolutely necessary for carrying away the foul water, and the system which deals with the alvine discharges of the population by some separate method.

Much of the want of success and non-progress in sanitary matters of late years are due to erroneous expressions that sewage is a material of great value, and until means or modes are known for securing this value, authorities are unwilling to take steps for promoting schemes of sewerage, as they appear to be more impressed with the idea of possessing some hidden treasure, which, by the way, cannot be found, rather than facing the difficulty, and looking at the question from a sanitary point of view, and taking the profit that will be realized by the prosecution of works of sewerage, or arising from the saving accruing from the prevention of the loss of health or premature death from preventible disease. From the author's experience, it would appear that it is the most profitable to a town to adopt the water-carriage system in its entirety; the treatment of the sewage at the outfall as one, although of primary importance, yet should have secondary consideration, having regard to the health and prosperity of the district to be treated. That sewage has a value cannot be gainsaid. That value, however, differs immensely in different localities. The value assigned by chemists to manures of this class universal experience shows is not its commercial value. The farmer finds in practice that it pays him better to purchase high-class manures, or manures which have been specially prepared for particular crops. Bulky manures never realize, commercially, the value assigned by the chemist. As an example, for farmyard manure, valued by the chemist at 15s. per ton, a farmer would rarely give more than a third of this amount. Night-soil, which has also been valued at 15s. per ton, seldom realizes more than 3s. per ton. The full value of sewage, whether applied directly to land or manufactured into a portable manure, can never be realized unless fortified with the several ingredients it lacks. Liquid sewage is a manure poor in phosphate but rich in nitrogenous compounds, while manufactured sewage manure is poor in nitrogenous compounds and potash.

Much as is the sanitary good derived from the sewerage of towns, and which will take place as long as sewerage works are properly carried out, it cannot be denied that a large number of the streams of the country have been polluted with the sewage of towns, the refuse of manufactories, the foul water from mines, &c., so much as to become unfit for subserving the purposes of man, and in some cases for the watering of cattle. In a sanitary point of view, the evils arising from the pollution of streams cannot always be directly traced; yet there can be but little doubt that foul decomposing matter cast into the streams of the country causes disease, and is baneful in its effects on the health of the inhabitants living on their banks, especially upon such as are compelled to use such water for dietetic purposes. It is, therefore, necessary that works should be carried out and measures taken to purify the sewage discharged into streams used to furnish a supply of water in districts below. Various attempts have been made to effect the complete purification of sewage, and on this point the interests of both the sanitary reformer and the agriculturist are one, as the complete purification of the sewage means the abstraction of the whole of the decomposing and fertilizing elements, which, if completely effected, will produce a great sanitary good. The question of the purification of sewage is one that must arise, and is totally independent of the system of collecting the fæcal matter now in operation in some towns. It has been conclusively shown that, with a dry system of conservancy, sewers and drains are necessary, and that sewage is produced which needs as much purification as in the case of a water-closet town. The fear at the present time is, that there may be too much generalizing, and an attempt made to lay down defined standards of purity which are to be made universally applicable, but which, under many circumstances, are totally unnecessary, and would lead to immense expenditure and serious loss to many communities. There are circumstances in which a high standard of purity is absolutely necessary, and, on the other hand, others in which the crude sewage may be most advantageously and economically got rid of by being discharged into the sea; and between these two limits there are gradations of purity required. When high standards of purity are required, experience shows that they can only be obtained with certainty when sewage is applied to land, and in other cases, where land is unavailable, a limited recourse must be had to chemical treatment.

The processes which have been proposed for treating sewage may be said to be of two descriptions—viz., artificial and natural. The artificial process includes both the mechanical and chemical treatment, while the natural process may be put down as irrigation and intermittent filtration. Of the materials which have been used for the mechanical treatment of sewage, it is hardly necessary to speak. It is admitted that such treatment can only be considered as an auxiliary to the chemical or natural processes, or to both conjointly.

Of the chemical processes, the *lime process* is the oldest, having been patented in 1846 by Higgs, and is probably, when efficiently carried out, one of the most successful in clarifying sewage. Lime acts on the sewage as an astringent, and coagulates the albuminous matter present in the same way as wine is clarified by isinglass. Lime also acts by neutralizing the free carbonic acid, which abounds in fermenting sewage, and which holds some of the earthy salts in solution, the lime added in this process being converted into a carbonate,

and precipitated in the deposit. The lime used in the treatment of sewage should always be perfectly fresh. To sewage of ordinary strength about 16 grains per gallon are required.

Treatment of Sewage with Salts of Iron.—In the lime process the action of the acids in the sewage upon the materials used produces precipitation, but in the application of the various forms of iron it is the action of the alkalies of the sewage that produces precipitation. When a salt of iron is added to sewage a precipitate is formed, composed chiefly of peroxide of iron, which is separated by the ammonia and other alkalies of sewage into an extremely flocculent precipitate, which drags down the suspended matters. The oxide of iron has, moreover, an affinity for organic matter; therefore a portion of this matter which is in solution is carried down with it; the salts of iron also carry down the phosphoric acid present in the sewage. Iron salts also act as a deodorizer, as sulphuretted hydrogen is removed by being converted into a sulphate or sulphide of iron. Iron is an antiseptic, and will preserve organic compounds from speedy decomposition. The first patent for the treatment of sewage with salts of iron was taken out by R. Dover in 1851.

Magnesium Processes of Purifying Sewage.—The action of magnesian salts on sewage is complex, but the resulting precipitate is probably one of the most valuable of all precipitates that do not derive their direct agricultural value from the agents used, as both phosphoric acid and ammonia may be precipitated in small quantities. The salts of magnesia that have been proposed for the treatment of sewage are phosphate of magnesia, superphosphate of magnesia, chloride of magnesia, nitrate of magnesia, sulphate of magnesia, burnt and slackened magnesian limestone, carbonate of magnesia, sulphite of magnesia, and carbolite of magnesia. Mr. T. J. Herapath's process, which was tried some years ago at St. Thomas's, Exeter, is an example of the magnesian processes. It was not remunerative, and was abandoned. In a patent taken out by Dr. Angus Smith and Mr. M'Dougall, in January, 1854, they state, speaking of magnesia, "It has the property of rapidly separating the two substances, which constitute manure in urine, sewage, and other organic refuse matters, but it was not used for that purpose because of its inefficiency as a deodorizer." "These substances are phosphoric acid and ammonia, with which magnesia combines to form the ammonio-phosphate of magnesia—a scarcely soluble compound of great value as a manure, and well known to chemists." They add, however, in their patent: "The facts relating to the action of magnesia on substances containing phosphoric acid and ammonia have been for some years familiar to chemists, and therefore we do not claim its use as our invention."

Alumina Processes.—The alumina processes for purifying sewage have been in use for many years. In France it has been largely used as a means of purifying water for domestic purposes. When salts of alumina are added to the sewage for the purpose of producing a precipitate, the alumina decomposes the bicarbonate of lime, which gives rise to the formation of sulphate of lime, which, with sulphate of potassa, remain in solution while carbonic acid is evolved, and hydrate of alumina, being precipitated in a flocculent form, drags down various mechanical impurities. Alumina also combines with the phosphoric acid, and is precipitated, and most of the phosphates of the sewage are secured. Alumina also enters into combination with certain organic compounds, producing insoluble matter, which it precipitates. This latter property of alumina is so well known that it is largely used as a mordant for fixing colours, as it combines with cotton, wool, &c., with such affinity that washing will not remove it. When lime is used as an adjunct to precipitate sulphate of alumina, it deprives the latter of its acid when it becomes insoluble in pure water, and is precipitated as a hydrated oxide of alumina, which envelopes the suspended impurities, dragging them down with it. This precipitate forms a sort of gelatinous substance, which is readily dissolved in solution of soda and potassa: hence some portion of the alumina remains in the affluent water after treatment. Professor Way and Dr. Voelcker have shown that clay (the base of alum) has the power of absorbing chlorine salts: therefore, when this material is used for precipating sewage, a small amount of chloride of sodium will be removed from the sewage. The ingredients necessary for the successful carrying out of the alumina process are so universally distributed over the country, and are so cheaply and easily procurable, that this process will commend itself on this account. This process was first patented by H. Stothert in 1852.

Phosphate Processes of Treating Sewage.—In the phosphate processes a material of considerable agricultural value is used, consequently it is supposed that a manure of great intrinsic value is secured in the precipitate. Although the precipitate undoubtedly has a greater valve than the precipitate produced by any other process, increased value is not derived from the sewage but from the ingredients added to it, and in the addition of these fertilizing ingredients they suffer a degradation in value by admixture with the inferior material precipitated from the sewage. Moreover, in all the phosphate processes it is necessary to add phosphates to the sewage in a soluble form, which is usually done by dissolving phosphate of lime or some mineral or fossil phosphate in acid. This addition of acid greatly increases the value of the phosphates, but when applied to sewage the acid has to be neutralized, and the phosphates are again precipitated in a less valuable form; in fact, this process of passing soluble phosphates through sewage causes them to lose 25 per cent. of their value. On account of the degradation in value of the phosphates, and also on account of the materials lost in the process, this system of clarifying sewage can never, in the author's opinion, be made commercially successful. The process is, however, advantageous, for it may be used very successfully in clarifying sewage previously to its application to land. It is now well known that sewage is a manure poor in phosphate and potash, and rich in nitrogenous compounds, and that, owing to the nitrogenous compounds present being so disproportioned to the other ingredients of value in utilizing the other ingredients, most of the nitrogen is lost; consequently, sewage in its normal condition can never be fully utilized upon land, so it has been proposed to fortify it with the ingredients it lacks, and for this purpose the phosphate processes of treating sewage have been commended. From what has been pointed out it is clear, if we wish to get the full value of the phosphates, it is better to place them direct on land rather than in the sewage; but as a set-off against the degradation in their value, the addition of phosphates to sewage deodorizes and clarifies it, so as to diminish the risk of nuisance arising from its application as a manure. As a precipitant, the phosphates act like alumina and salts of iron, and they are rendered soluble by an acid which is either neutralized by the alkalies of the sewage, or by the addition of an alkali when an insoluble precipitate separates from the sewage, which drags down the suspended matter present. In the simplest form, if bone or bone-ash is treated with sulphuric acid, a soluble superphosphate of lime is formed; but if the acid is neutralized by caustic lime, insoluble phosphate of lime is precipitated. If phosphate of alumina is dissolved in acid, it will be rendered soluble; the addition of lime neutralizes the acid, and the phosphate is again precipitated as an insoluble phosphate of aluminia, and the same action takes place when other earthy bases combine with phosphoric acid; the precipitated phosphates, however, are of more value than the original insoluble phosphates, as they are supposed to be brought into that state which they would naturally assume on being applied to land; but in no case are they so valuable as in the intermediate state just after they have been treated with acid. The principal object which has been sought to be achieved by more than one phosphate process is the abstraction of ammonia from sewage by a process long known to chemists. It consists in the application of phosphatic and magnesian salts, which have the power of combining with ammonia as before referred to. In practice this has never been found to entirely succeed with sewage, and the reason for it is, that this triple salt readily dissolves in water containing common salt or salts of ammonia. It is also soluble in water charged with carbonic acid. There is nothing particularly new in the modern phospate processes, which were thoroughly investigated some years ago by Sir J. Murray, M.D., and in 1849 a paper was read before the British Association by Dr. Buckland, then Dean of Westminster, who, after tracing the formation of coprolites, and showing that clay, marl, and lime were the agents used by nature to absorb phosphoric acid produced in the process of decomposition, he suggested that these agents should be used for absorbing the phosphates of sewage by combining with them, and so deodorizing the sewage. The first patent for a phosphate process was taken out in 1858 by G. L. Blyth, consulting chemist to the General Board of Health, and since that period a large number of patents have been secured.

Many other processes have been proposed for treating sewage, such as materials for absorbing, evaporating, freezing, &c., and the precipitates in turn have been proposed to be manufactured into manure, fuel, as well as converted into food for cattle.

Of all the processes which have been adopted for the purification of sewage, there is no process equal in efficiency and permanency to the application of sewage to land. All the chemical processes have hitherto failed to completely purify sewage under favourable circumstances, and fail entirely at times in treating an article not only varying in quantity, but extremely variable in quality; and it is therefore most difficult to carry out any chemical process which requires an exact amount of chemical ingredient to be added to sewage of an unknown quality or quantity; but in the irrigation system, increase of quantity or variation in quality is readily adjusted. Irrigation pure and simple is almost totally independent of seasons, and in some cases intermittent filtration through land or artificial filters may be adopted; but it is desirable that with intermittent filtration areas, the success of which is due to atmospheric air contained in the interstitial spaces in the soil, they should be, in some cases, protected from the weather, so that in continuous wet weather the soil shall not be deprived of the air necessary for the oxidation of the polluting matter contained in sewage.

The author is aware that it is impossible, in the limited space of a paper of this description, to completely elucidate the subject, or supply the details of works of sewerage or modes of purifying sewage, and the paper must therefore be looked upon simply as a *résumé*, the object of which is to open up discussion on the all-important point of town sewerage.

SEWAGE: ITS USE AND ABUSE.

By CHARLES E. JONES,
Manager of the Chesterfield Gas-Works.*

It is not too much to affirm that one of the great sanitary and social questions of this generation, one which is becoming more and more urgent, and perhaps more beset with difficulty, is, "What to do with Sewage?" Bearing in mind that this century has witnessed sewerage operations and sanitary undertakings of immense magnitude, and that we have sanitary reformers and engineers and medical officers of health innumerable, who make sewage questions their speciality, this problem should be easy of solution. That it is not yet solved is evident, but that science will eventually prove victorious, I have not the slightest doubt, and that consummation will be materially accelerated by scientific institutions such as this discussing and ventilating the subject thoroughly.

We have each one of us a personal as well as a common interest in this matter. The death-rate of a district is intimately associated with, and influenced by, its sewerage arrangements, and, as the Government has intimated its determination to legislate further on sanitary matters, including the pollution of rivers, in the next session of Parliament, it appears to me that the present is certainly not an inopportune time to entertain its consideration.

Our forefathers, with the wisdom which characterized them, regardless of the fish and posterity, quietly turned their filth into the rivers and watercourses of the country, and either trusted to the oxidizing action of the atmosphere, or to the chance of its reaching the sea in order to be rid of it. This simple plan very many towns would be quite content still to practise, did not Parliament deny their right to pollute the rivers, or to use the watercourses of the country for this purpose, and did not, furthermore, a variety of circumstances and sanitary conditions conspire to interfere with its successful operation. The scarcity of water in various parts of the kingdom, and indeed generally, at a period of the year when, under our present system of disposing of it, sewage requires the most, the diminution of our rivers and streams from various causes, the rapid increase of the population, and the marvellous development of the mineral, manufacturing, and commercial resources of the country, have sealed the doom of sewage-carrying rivers, and inland towns, at all events, must seek other means for its disposal. At first sight this subject does not appear an inviting one, rather the reverse; nevertheless, it is one which is extremely important, and even interesting, and I venture to hope to be able to enlist your interest in its consideration this day.

The paper then proceeds, by a very lengthy and exhaustive chemical analysis of sewage, to show its really extraordinary components in brilliant colours, valuable salts, and important manurial products, the latter of which the writer showed to possess all the constituents of plant life. He then proceeds:

I hope, therefore, you will agree with me that here we have a universal manure, and we have only to use it as Nature gives it us, undiluted and unmixed with foreign matters, and properly apply it to the soil, and we have no need whatever to send to Peru and elsewhere for guano for farming purposes. We had far better spend our capital at home, and utilize what we shall eventually find to be valuable products. Guano is frequently adulterated with sand, sawdust, and mineral matters, and its value for fertilizing purposes is estimated according to the per centage of the more valuable compounds which furnish plant-food.

We will consider the value and waste of sewage, taking for the sake of convenience and example the district in which we find ourselves. It is computed by the best authorities that each individual contributes 12½ lbs. of ammonia in a year, so that the value of the sewage of Chesterfield, in ammonia alone, amounts in round numbers to £400. The total quantity of sewage produced per head of the population is estimated at 10 cubic feet per annum, the value of which is taken at 10d. per foot, which amounts to £5000 for Chesterfield, and £2000 for Brampton, or more than £32,000 for the district.

It is a maxim among sanitary engineers that a good system of sewerage gives back to the soil those constituents which we in our food have taken from it, but what is deemed the best arrangement by the enlightened governing bodies in this district is to present them to the river Rother, and not to the soil from whence they were originally derived. The folly of such a course of proceeding in this district, nearly the central one of the kingdom, is manifest, and would be amusing were it not mischievous.

Were the excreta of the population of Great Britain properly utilized, and not wasted, as at present, it would be sufficient to pay off our National Debt in about seven years. But we pass on to consider the agents employed and at our command for the removal and disposal of sewage. The agent more generally employed for this purpose is water—pure water—often obtained at considerable cost and difficulty. There are other means which might be employed for the same object—viz., air and earth, but these are either in disrepute

* The substance of a paper read before the Chesterfield and Derbyshire Institute of Engineers, on the 3rd inst.

or but little known. The water theory is the more popular at present; whether it will continue to hold its ground is open to some doubt; at all events we will, as briefly as possible, discuss the leading features of each system, and endeavour to ascertain if we have chosen the best.

Where the water-closet system is general, which is not so in this locality, we see the water carriage of sewage in its perfection, of which London is the best example. The total approximate weight of the excreta of the metropolis per day is a little more than 4000 tons, of which not more than 10 per cent. is solid matter. The water supply and the rainfall added together will exceed 750,000 tons, and this enormous quantity of water is employed to remove about 4000 tons of sewage. Sewage works, without a parallel in the world, have been constructed under immense difficulties at a cost of four millions and a quarter sterling, and the next generation will probably be called upon to subscribe a similar sum in order to extend the works to carry the sewage out to sea, to prevent the deposit of dirt or refuse obstructing the navigation of the Thames.

In many other towns we find the same folly practised. The material, which is worth some 30s. per ton, is rendered nearly valueless by the reckless addition of water, which, in its turn, cannot be obtained without some expense. Let it not be forgotten that water is simply a vehicle, or sewage carrier; it is not a *chemical disinfectant*, but simply the means employed to carry the sewage, and deposit the same along the river banks and at our neighbours doors, polluting the streams, poisoning the fish, and impregnating the atmosphere with pestilential gases at deadly enmity with human life.

Now, a little sewage at once renders a large bulk of water equally offensive, especially if putrefaction has progressed, or is actively commencing; it also washes out, as before alluded to, those properties which render it so valuable as a manure. At best it is but a clumsy and extravagant method, and is attended by numerous evils from beginning to end. Leaky drains and sewers, soddening the earth with foul putrescence, and polluting the wells and augmenting the death-rate —each house and premises being connected by pipes to vast reservoirs of sewer gases, which, in spite of traps and other mechanical contrivances, force their way into our dwellings—are a type of the evils patent to ordinary observation. The victims to this system will never be numbered, and a large proportion of the "ills that flesh is heir to" are distinctly traceable to this sanctioned and popular method of poisoning mankind.

The paper next deals with the air system, and then passes on to consider earth as the natural deodorizer. The writer says:

Objection is taken by the opponents of the earth-closet, that about 3½ cubic feet of earth are required to absorb and deodorize about one cubic foot of sewage, consequently the cost of removal is materially increased. This is, doubtless, correct, for unless the earth be used largely in excess of the excreta, it has no deodorizing action whatever. By the substitution of charcoal for dry earth, this objection is overcome; and after being used over and over again several times, the charcoal is preferred to other kinds by the sugar refiner for the purposes of his trade. Earth, like water, is a mechanical agent to a great extent, and, unless properly used, exerts no deodorizing action upon sewage when its decomposition is advanced, as any gentleman can prove to his own satisfaction by filtering a little putrid sewage through it; it passes through unchanged. Charcoal, on the other hand, possesses great deodorizing capabilities; and, in addition to its moisture-absorbing power, it exerts a surprising *occluding* action on the noxious gases that the partial decomposition of sewage gives off.

In conclusion, I think I have endeavoured to demonstrate that the *use* of sewage proper is to apply it to the land, restoring to Nature those materials without which she is unable to carry on her plant-building architecture; and that the *abuse* of it is to dilute it, as is now the popular practice, with some 300 times its bulk of water, and convey it into the watercourses and streams. We commit a vast error when we undertake to pollute rivers with valuable manure, which, moreover, leads to costly litigation. Let the manufacturers *alone* indulge in such pastime, and assume the legal responsibility. Let us, however, keep the excreta out of drains and sewers, and unmixed with the liquid refuse before enumerated. Let the sewers and rivers perform their legitimate functions, which are not, as many people seem to suppose, those of carrying sewage.

Bradford Gas and Water Supply.—At the meeting of the Bradford Corporation on Tuesday last, reports were received from the Gas and Water Committees. With regard to gas, it was stated that the necessity for extension being urgent, the conclusion had been arrived at that the only proper course was to make arrangements for additional works at Browmoyd and Laisterdyke; and it is hoped, when these are completed, that the sites of the works at Mill Street and Thornton Road may be closed. It is recommended that parliamentary powers be obtained to raise the requisite funds. The rights of the Shipley and the Eccleshill Gas Companies within the borough had been purchased. The former for £1800 and the latter for £3500. The sum claimed by the former was £2000, and by the latter £5400. Bolton is now supplied with gas by the corporation. In reference to the water supply, the report, after alluding to the scarcity of water during the past summer, arising from the want of rain, the increased demand, and the necessity of further powers being obtained to extend the works, states that the high level works are so well advanced that there is every probability that the wants of the high-level district will be fully met. The determination has been come to recommending the council to take steps for extending its powers in regard to the low-level supply, so that three new storeage reservoirs may be constructed within the gathering-grounds of the present works, to catch the flood waters that are now lost. If powers are obtained and the new works commenced at once, some part of them may be completed before any serious inconvenience is felt for the want of water. The report next notices the proceedings in Parliament, and then states that Barden reservoir was first filled on the 19th of March, continued full for five weeks, when water was drawn from it in various quantities up to 7,000,000 gallons a day in the last week in June. All the works at the reservoir are sound and good. The south end of the puddle trench is being extended a little, and some levelling has to be done. The embankment at Grimwith reservoir has been raised, the waste channel completed, and the reservoir is in good working order. Chelker reservoir has been nearly empty since the first week in June. Heaton Bank reservoir is nearly completed, and will be filled during the winter if sufficient water can be obtained. Respecting the progress of the works at Leeming and Leeshaw reservoirs, in the Worth Valley, it was stated that the latter has not progressed satisfactorily in consequence of natural difficulties. The Oxenhope tunnel has made slow progress, but it ought to be finished before the end of the present year. The first division of the Oxenhope conduit has been let, and is progressing; the second division is about to be let, and is ready to be commenced immediately. New iron mains are being laid round the town in place of the old ones, which are too small. All the other reservoirs and works have continued in good order, except the main conduit from Heaton to Burnsall, which was found to leak, and has been repaired. The sites of the proposed reservoirs at Bunkers Hill, Bowling, and Thornton Moor, have been purchased, and many owners have been dealt with for the new high-level works at Oxenhope and Haworth. Arrangements had been made with certain owners for the making of new roads across their property in the line required for the new mains, instead of the land being purchased for the pipe only. The supply from the low level has been extended to Silsden, and to Allerton from the high level. Notice has been given to the out-townships that the charge for water after the present year would be raised from 6d. to 9d. per 1000 gallons. The soke rights had been extinguished, and arrangements had been made with the millowners interested for the use of water from the new reservoir now in progress. Owing to the failure of the contractor, the completion of the reservoir had to be taken in hand by the committee. The income from the sale of water, which in 1863 was £17,043, had risen in 1873 to £55,875.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The finished iron trade may now be described as fairly active, and though the amount of business actually transacted during quarter week was below the usual average, yet the prospects of the trade are good, and there is little underselling going on. The reduction on best brands declared last week has not in any way affected the quotations for second-class qualities, and the prices of ordinary, sheets, hoops, and strips are firm at the rates current a fortnight since, the makers of sheets are still exceptionally busy, the demand for galvanized roofing purposes being very brisk, best sheets are quoted £16 to £20 10s. for coke qualities, and ordinary unbranded singles still command £13.

The pig iron market is rather unsettled, though producers are fairly well off for orders and are very sanguine about the future, a number of furnaces are in course of preparation for "blast," amongst the concerns about to "relight" may be mentioned the Bromley Iron Company, Messrs. Grazebrook, Messrs. David Jones and Sons, and Messers. W. Ward and Sons, the current quotations for Staffordshire pigs are—All mine, cold blast, £6 5s.; hot blast, £5 5s.; common, £3 15s.; cinder, £3 5s.

The demand for coal has considerably improved both for household and manufacturing purposes, and there is every prospect of a good winter's trade, it is now generally conceded that prices will not be lower before March next, the colliers are in tolerably regular work and manifest no disposition to "play" where the pits are in full operation. The survey of the district for the purposes of the mines drainage scheme is now completed, and active operations have been commenced in several places.

The ironfounders are as a rule in well-sustained operation. Gas and water mains and machine castings being among the more prominent features of inquiry. Wrought tubes are in somewhat improved request, though the demand is far from buoyant.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

The strike in the Wigan district continues, and although up to the present time colliery proprietors have been working upon the stocks they had in hand, these in many cases are becoming exhausted, and some descriptions of coal are scarce. Best coal and gas coal are difficult to obtain; for the latter there have been numerous inquiries from consumers who have not secured contracts, and good prices are now being obtained. Small coal and engine fuel are, however, fairly plentiful as supplies are being offered pretty freely from other districts, and although prices are at present stiffer, in some few cases small advances having been made, this will only be of a temporary nature whilst the strike continues. The pit prices range about as under:—Arley Mine, 14s. 6d. to 15s.; ordinary house coal, 13s. to 14s; furnace coal, 12s. to 13s.; burgy, 8s. 6d. to 9s. 6d.; and slack 6s. to 8s. per ton.

The Manchester market is very firm, as a considerable quantity of coal is being drawn from it to the West Lancashire districts. Some of the colliery proprietors are now very much behindhand with their orders, and generally stocks are now being filled up. Although some of the smaller concerns are charging higher rates, the quotations of the leading firms are unchanged, and the pit prices for the Manchester district may be quoted as under:—House coal, 12s. to 15s.; furnace coal, 10s. 6d. to 12s. 6d.; burgy, 8s. 4d.; and slack 5s. 6d. to 6s. 6d. per ton. The coke trade is a trifle better; there are more inquiries, and prices are steady.

Both masters and men in the West Lancashire districts maintain an attitude of firmness in the present struggle, but as the miners are receiving no support from the association, it is not likely they will be able to hold out long. The men, however, speak of standing out until the close of the year, and at some of the pits that have not ceased work they have sent in notices of an advance of 15 per cent.

Since last week there has not been the reduction in the price of pig iron which it was anticipated would follow the reduction in Staffordshire manufactured iron, and Yorkshire pig iron, for anything like early delivery, is quoted at quite as full rates as at any time during the past four or five weeks. There is an increasing demand for forge iron, and this quality shows every sign of being stiffer during the next two months. In manufactured iron there has not been the same anxiety to buy, but whatever business has been done has generally been at late rates. The quotations are as under:—Pig iron, No. 1, 79s.; No. 3, 74s. 6d. to 75s.; No. 4, foundry, 72s.; No. 4, forge, 67s. 9d.; mottled, 66s. 6d.; and white, 65s. 6d. per ton net cash s.w. delivered in the Manchester district. North Staffordshire bars (first-class makers), £10 2s. 6d.; ordinary makers, £9 10s. to £9 15s.; Lancashire made rails, £9 10s.; Middlesborough light, £9; Middlesborough heavy, £8 per ton delivered.

Both founders and forge proprietors throughout this district continue well employed, and many of them are still unable to book orders for anything like early delivery.

The strike at the blast furnaces in the neighbourhood of Wigan, noticed last week, has been settled by the men accepting the masters terms.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

A good deal of uncertainty prevails in the coal trade of the Tyne as to what will be the result of the notices that have been served by the Northumberland coalowners upon the miners, of a termination of their engagements, which notices will expire on Friday next. The men have found out they have made a great mistake in not having the points in dispute submitted to arbitration; and if a meeting can be held between the representatives of the men and the masters before the end of the week, possibly this may be arranged yet. If not, there will be a strike. So far as the gas coal trade is concerned, it would not be directly affected by it, as very few gas coals are wrought in Northumberland; but incidentally, no doubt, it would. If the strike were prolonged, there would be an extra demand for Durham coals, and the gas collieries, with others, would feel the reaction. At present the large Durham gas collieries which have heavy contracts running are shipping considerable quantities of gas coals at the Tyne Dock, the Felling, and other places upon the Tyne. There is no special activity, however, for second-class gas or for manufacturing coals. There is rather a good coasting inquiry for households: and business is pretty stiff for London. Prices may be quoted as follows:—Household coals, from 12s. 6d. to 15s. per ton; steam, 13s., 15s., and 18s. per ton, according to quality; gas, 10s. to 14s. per ton. But these rates are a good deal modified by discount, which is not in every instance limited to 2½ per cent. The arbitrators are sitting in the Central Station Hotel, Newcastle, and taking evidence with regard to the price of coal and state of wages in the Durham district, but the proceedings are strictly private.

There is not an excessive amount of handy coasting tonnage in the market, and as merchants have been anxious to get their orders filled up for the byeports, more money has had to be paid in freight. In some instances, 6s. 9d. per ton has had to be given for handy little ships to discharge at the wharves at London. A very poor outward foreign trade, however, is stirring, and a large fleet of steamers have little or nothing to do.

At the Middlesborough Iron Market business has been rather quiet upon the whole, though for some classes of iron there has been a fair demand. There was more uneasiness in trade last week than there has been noted for some time. This, no doubt, was occasioned by failures which occurred in the Tyne-

side district. There appears to be little question but that middle men hold too heavy stocks of iron as of other material. "Bulling and bearing" operations are not very extensively adopted in the North of England, but where they have been they have proved very disastrous this year to the parties concerned, and it is amongst this class principally where the failures have occurred recently; and, until the full extent of the mischief is known, a feverish condition of business, which is not usual in this part of the kingdom, will no doubt prevail.

The general trade of the North of England is flat. Less business has been done in fire-clay goods, cement, and other articles, and the stocks of timber are heavy.

The discussions with regard to the deficient water supply of Newcastle and Gateshead and North Shields, which have been going on for some time in the Town Councils of these boroughs, have arrived at a stage when something like an official inspection will take place; but, whatever may ulimately ensue, it is not likely that any parliamentary notices will appear in November.

COURT OF COMMON COUNCIL.—At the Meeting on Thursday last, the report of the Gas and Water Committee, which was published in the JOURNAL of the 25th of August, on the supply of water to the City in case of fire, was taken into consideration, and after some discussion the recommendations of the committee were adopted, and it was referred back to them to consider the question of establishing a system of hydrants throughout the City, and the best means of carrying the same into effect.

CARDIFF GAS COMPANY.—Notices have appeared in the local papers announcing the dismissal of two of the collectors of this company, who, it is said, have robbed their employers to a considerable extent.

DEATH OF THE MANAGER OF THE PONTYPRIDD GAS-WORKS.—On Monday, the 12th inst., Mr. Lawrence, who had been manager of the Pontypridd Gas-Works from the time they were first started, died at his residence, within the works. Deceased was in his sixty-ninth year.

NORTHAMPTON GASLIGHT COMPANY.—The annual meeting was held on Thursday, Oct. 15, at which the full dividend allowed by their Act was declared, and a surplus carried to the reserve-fund. The directors also announced that they had made a further reduction of 3d. per 1000 in the price of gas, which, with the reduction of 6d. declared last Lady-day, made the present price of gas 4s. 3d. per 1000.

DEATH OF MR. ORLANDO BROTHERS.—We record with feelings of deep regret the premature decease of this gentleman. Mr. Brothers was the eldest son of the late Mr. Orlando Brothers, and succeeded his father as the manager of the Blackburn Gas-Works some few years ago. It appears that about a month ago he became incapacitated from attending to his duties through the progress of the disease—rapid consumption—which carried him off on the 11th inst., at the age of 29. He was buried on the 15th in the family vault in Blackburn Cemetery.

BIRMINGHAM PUBLIC LIGHTING.—The inhabitants of Birmingham will be glad to know that the dissatisfaction which has been so strongly expressed with reference to the extinguishing of the lamps several hours before daybreak, has at last prevailed with the authorities, and that our streets are again to be lighted the usual length of time. At a meeting in St. Paul's Ward, last evening, Councillor Parry, who is a member of the Public Works Committee, stated that that committee had decided at their last meeting that the lamps should not be put out until daybreak—a decision which, though tardy, will give general satisfaction in the town.—*Daily Post.*

RICHMOND DRAINAGE AND WATER SUPPLY.—At a special meeting of the Richmond Select Vestry on Tuesday last, it was resolved that an application should be made to the Thames Conservators to receive a deputation from the vestry, to confer upon the proceedings now pending, and as to the course they will be disposed to take in regard to the degree of purification repuired. A petition is being signed for presentation to the Local Government Board praying that the application of the vestry for sanction to a loan for works of water supply to the town may receive the favourable consideration and sanction of the board.

ROTHERHAM PUBLIC LIGHTING.—The lighting sub-committee of the local board report that the sum expended in lighting the public street-lamps during the financial year ending the 31st of August last, was £13,996 4s. 3d., the receipts for lighting private lamps, damage to public lamps, and sale of old material being £127 16s. 10d., leaving the net cost £13,868 7s. 5d., or £172 7s. 5d. less than the committee's estimate. The sub-committee, having regard to the large number of applications for new lamps, recommend that 200 be erected during the current year, and if this recommendation be adopted the cost will be for gas, £11,118; wages, £2860; new lamps, posts, pipes, and fittings, £600; repairs, paint, material, &c., £322—£14,900.

BRECHIN NEW WATER SUPPLY.—On Saturday, the 17th of October, the new water-works were opened, the ceremony being performed by the Earl Dalhousie. The total expense of carrying out the scheme amounts to about £15,000, upwards of £9000 of which has been paid to Messrs. Eddington and Sons, Glasgow, for pipes, and about £6000 to Mr. Fettes, architect, Brechin, who contracted for all the other works, sub-letting the different departments. The engineer was Mr. Gale, C. E., Glasgow. Mr. George Henderson, Brechin, was resident engineer; and the duties of inspector were performed by Mr. James Eadie, Glasgow. The supply of water will be equal to about 40 gallons per day to each inhabitant, so that there will be a large margin available for manufacturing purposes.

FATAL ACCIDENT AT THE CHESTERFIELD GAS-WORKS.—On Tuesday evening last, about half-past six o'clock, a shocking accident occurred at the new gas-works now in course of erection at Chesterfield. The contract for ironwork, it appears, had been let to the Horsley Iron Company. Last week the foreman of the contractors and a gang of men arrived to proceed with the work, which progressed satisfactorily up to Tuesday night, when, in raising an iron girder, the chain gave way, and it fell upon four of the men, two of whom were killed instantly; the third (the foreman) was seriously injured, three ribs being broken; and the fourth man was badly bruised about his body. An inquest on the bodies of the deceased was held on the following day, and a verdict of "Accidental death" recorded.

EXECUTION AGAINST THE DUBLIN CORPORATION.—Our Dublin correspondent, says: "It is very likely that to-day or to-morrow bailiffs will enter the Mansion House and City Hall of Dublin and carry off all the corporate property, under an execution for about £8000, issued against the corporation by the collector-general for rates due on the water-mains. The corporation have ordered the debt to be paid by the Water-Works Committee. They dispute their liability, and say they have no funds, so that there is a very pretty imbroglio. The collector-general is tired of waiting—as well he may be—the original judgment having been obtained over a year ago; so that if the money be not found somehow the Lord Mayor may find the Mansion House rendered desolate before his return from America."—*The Standard.*

GAS EXPLOSION IN A RAILWAY TRAIN.—An alarming explosion of gas happened shortly after five o'clock in the afternoon of Wednesday last, in the guard's van of a first-class passenger train from Manchester to Accrington. When the train arrived at Bury it was found to be in darkness, and on attempting to light the lamp in the guard's van an explosion ensued, which knocked down the guard and the station-master, and set fire to the parcels, mail-bags, and luggage in the van. The fire-bell was rung, and by great efforts the flames were soon extinguished, but not before a great many letters and newspaper parcels were partly destroyed. The guard was placed under the care of a doctor. He is very seriously burnt about the face and head. The cause of the explosion is thought to be from a leakage in a pipe, which it is believed had been tampered with by some one who had gained access to the guard's van. The station-master is not seriously hurt, although he was hurled with great force to the platform and suffered the loss of his eyebrows and part of his whiskers. The hair on the top of his head was also singed.

BEDLINGTON WATER SUPPLY.—Mr. Arnold Taylor, one of the inspectors of the Local Government Board, has been holding an inquiry with reference to a scheme of water supply for the Bedlington Local Board district. The local board propose to obtain a supply from the river Blyth at a cost of £13,000. Parts of the district are already rated for water supply the water-rates in Scotland Gate being 1s. 6d. in the pound, and at Guideport 2s. in the pound. Yet at these places scarcely any water supply exists. The population of the district is 17,000, and the difficulty in obtaining water was at times very great. The evidence as to the scarcity of the water was startling. One witness, Mrs. Mitchell, said that she had to go at two o'clock in the morning to get water, and even then it was sometimes all gone. Sometimes they were able to buy water of a man who came round, at one halfpenny a canful. It often occurred that she could not get any water for cooking. Another witness said that she had to pay one halfpenny a can for every drop of water she got, and sometimes she was unable to get any water at all, although she was willing to pay for it. It cost her, with eight persons in the family, 7d. a week for ten water. A witness from New Winnington stated that he had seen females up at four o'clock in the morning, and he himself had had to go to drains to get a supply. The probability was that the inadequate supply of good water led more to drink beer. Occasionally the miners had no water to take to the pit, and he had seen them fill their bottles in the pit with water that they had to spit out again. A witness from Bedlington stated that she had to get up at four and five o'clock for water, and even then had sometimes to wait a whole day before she could get it. She had, notwithstanding, to pay a water-rate of 7d. in the pound. There was a good deal of similar evidence, yet there were some persons who attended the inquiry who were of opinion that the proposed scheme was quite unnecessary.—*Local Government Chronicle.*

Register of New Patents.

589.—HENRY, W., Leicester Square, London, "*Improvements in lighting and heating with carburetted hydrogen gas.*" Provisional protection only obtained. Dated Feb. 17, 1874.

According to this invention, hydrogen gas is prepared in any suitable vessel, which should contain two separate chambers, the lower being connected with the upper by a pipe reaching from the bottom of the upper to within a very short distance of the bottom of the lower chamber, there being an opening in the top of the lower chamber, for the purpose of introducing any suitable metal or other material, the opening being closed by fixing an air-tight cover. From the upper part of the lower chamber there is an exit-pipe for the conveyance of the hydrogen gas to the carburettor. The lower chamber having been charged with any suitable metal or other material, by preference zinc or iron, a mixture, consisting of about three parts of water and one part of hydrochloric, sulphuric, or any other suitable acid, is introduced into the upper chamber, whence it passes into the lower chamber through the pipe communicating therewith; and, by the action of the acid upon the metal or other suitable material which may have been placed in the chamber, its solution is thereby effected with the disengagement of hydrogen gas, which is caused to pass through a mixture of hydrate of lime and water, and thence into a chamber, which is called the carburettor, charged with hydrocarbon oil. This chamber will then give off from an exit-pipe illuminating gas.

598.—YARROW, E. H., Camberwell Park, Surrey, "*Improvements in the manufacture of gas and in the apparatus connected therewith.*" Patent dated Feb. 17, 1874.

The object of this invention is to manufacture a permanent gas from petroleum, or other liquid hydrocarbon or cognate oil, in such a way that the apparatus necessary for such manufacture shall be of the simplest possible character, and that the costs of the manufacture shall be reduced to a minimum.

In order to accomplish these ends, a retort of a peculiar construction is employed. This retort may be of any suitable shape, either oval, round, square, or D-shaped, and is divided throughout its whole length by means of partitions or tubes in several compartments, arranged in such a way that when the oil or gas is introduced into one end of the retort it will travel along a zig-zag passage, until the vapour finally escapes from the opposite end of the retort.

While the vapour is passing through the compartments or tubes of the retort, it is subjected to a very high degree of heat, which causes the hydrocarbon vapour to become decomposed, and be transformed into a permanent gas.

In order to increase the volume of the gas as the vapour passes with a rush from one compartment or tube of the retort to another, it is caused to draw in with it a regulated quantity of atmospheric air. This air, as it passes through the retort with the vapour, also becomes decomposed, and forms with the gas a chemical mixture of high illuminating power.

601.—M'BEATH, C., South Cobbinshaw, N.B., "*Improvements in retorts and apparatus connected therewith, for the purpose of distillation and calcination of minerals, parts of which are applicable to other purposes.*" Patent dated Feb. 18, 1874.

This invention consists, first, of improvements upon the retort or still and condensing apparatus, described in the patent dated the 29th of October, 1866, No. 2788, for the distillation of shale and coal, for the production of oils, paraffin, tars, and ammonia, and illuminating gas therefrom, and also for calcining ironstone and limestone for the usual purposes of making iron and ardent lime, and also for the new purpose of obtaining crude oil and tar and carbonic acid and sulphuric acid from the former, and chlorine and carburetted hydrogen from the latter; and, secondly, of a new or improved construction of fluid exhausting and forcing apparatus or pump for drawing off the gases as they are evolved in the retorts, and in forcing them through or into condensers of either the improved construction referred to under the first part of this invention, or it might be of other retorts or stills and condensers for treating and obtaining the substances stated.

The nature of the improvements under the first part consists in making the conical retort square or rectangular at the lower open combustion mouth a short distance above the furnace bars, which are round and hollow, with angled projections on them, for being turned at intervals by wheels and motive power, or a hand winch, for the distillation of shale, but for ironstone and lime these bars are not required. An annular or narrow space is left between the outside of the retort, and the inside of its close heating-chamber or outer brickwork supporting the retort above the hearth, and having a flue and controlling damper at top leading to a separate chimney for each retort, or to a chimney for, or common to, a set of retorts. Another improvement consists in placing the conical feeding vessel, concentric at top, with a neck charging-pipe dipping down into the mineral being treated below the branch or pipe at top for drawing off the gases as evolved, by the new or improved exhausting or forcing machine, which consists of a large hollow double concave dome-ended vessel, with an elastic or flexible disc or diaphragm, jointed tightly between flanges formed in the centre between the ends so as to form two suction and discharge chambers out of the vessel, by the reciprocating of the diaphragm to and fro within it as a piston by the action of a rod working out through a stuffing-box at one end, having its inner end attached by broad circular disc flanges to and on each side of the middle of the diaphragm, so that it and the rod are actuated by a connecting-rod and crank from any adjacent motive-power engine or geared shaft. The gases are drawn off from

the top of the retort through entering ducts and valves into each chamber on the in-stroke, and discharged through outlet valves and ducts on the out-stroke into the condensing apparatus, which may be of the construction described in the former invention, or of other forms and arrangements of condensers such as a number of close vessels, with the inlet forcing-pipes led down some inches into the liquids in them, and be outlet branches or ends led away from the top of each vessel, so as to conduct the gases not condensed down into and through the condensed liquids of the next vessel in succession, the last vessel or its ducts having an outlet-valve to conduct the permanent gases to a chamber for subsequent use, as when inflammable for lighting and heating purposes, or for being led by a pipe back into the hearth of the retort to assist in the distillation or calcination of fresh mineral.

605.—ABEL, C. D., Southampton Buildings, London, "*Improvements in gas motor engines.*" A communication. Patent dated Feb. 18, 1874.

This invention relates to improvements in gas motor engines of the kind described in patents Nos. 434 of 1866 and 2245 of 1867.

They consist chiefly in the construction and arrangement of a crank, levers, and rods connected thereto for working the slide and for partly moving the piston, such crank being either moved by the engine-shaft, or left at rest according as a pawl mounted on it is engaged with or disengaged from a ratchet-wheel on the engine-shaft. The engaging and disengaging of the pawl is effected by the movement of the piston in its descent and ascent, and is also controlled by a governor in such manner that when the engine-shaft is revolving with sufficient speed the expenditure of gas is stopped.

The slide is arranged for the admission of the combustible gaseous mixture and of an igniting flame to the cylinder, and for the emission of the products of combustion from the cylinder by the same passage.

The engine-shaft is carried on brackets projecting from a ring fixed on the top of the cylinder arranged so that the piston can be taken out without dismounting the shaft. The piston-rod has a groove at the back, working on a dovetailed guide, on a bracket fixed to the top of the cylinder; and beneath this bracket is a caoutchouc buffer, against which the piston can strike.

The toothed ring of the clutch apparatus is of wrought iron, fixed to a cast-iron nave loose on the engine-shaft, having a lip shrunk on the toothed ring; this nave has a boss projecting into a recess in the nave of the clutch apparatus, into which recess the oil escaping from the loose nave drops, and flows out through a pipe.

The water jacket is made to extend to the top of the cylinder, so as to afford sufficient capacity to render its continuous circulation unnecessary.

622.—SIEBERT, O., New York, "*Improvements in gaslight apparatus.*" Provisional protection only obtained. Dated Feb. 19, 1874.

This invention relates to the construction of a device for regulating the supply of gas to the burner, consisting of a conical pointed plug or valve fitted into the tube in which the burner is secured. The interior of this tube has a screw thread, and the plug or valve has a corresponding thread, so that it may be screwed up and down to adjust it to the burner. The plug is hollow and its lower end open, its upper or conical end being closed; above its screwed portion the plug has a circular channel, which communicates by four small holes with the interior of the plug. The tube is screwed on the pipe-bracket or other fitting in place of the ordinary burner or burner-tube. The plug or valve admits the gas to the burner through the holes in four different directions, the regulation of the flame being effected by adjusting the conical pointed plug or valve until the proper size of flame is obtained, and when this is done it will require no further adjustment. This regulator may be applied to any gas-burner, either with or without a chimney, and will only permit the passage of the exact quantity of gas required for giving a clear and bright light, thereby effecting a great economy of gas. A globe or chimney of any kind may be used with this apparatus.

In instances where the light is subjected to draughts or currents of air, there is placed below the globe a disc or saucer of opal glass or other suitable material, slightly larger than the aperture at the bottom of the globe, a space being left between it and the disc, through which the air enters in such a manner that no external agitation of the atmosphere will affect the steadiness or purity of the flame. Over the top of the globe is placed a reflector of opal glass, with its under or reflecting surface concave, having a diameter equal or nearly so to that of the aperture in the top of the globe. This reflector also serves as a smoke-arrestor. A similar but smaller reflector and smoke-arrestor is placed over the chimneys or tubes of Argand burners. They are secured upon the globes or chimneys by clips of iron, brass, or other suitable metal, curved in the direction of their length to give them elasticity and facility of adjustment, and also made concavo-convex in transverse section; they are formed at both ends with spring jaws, whereby they are securely attached to the globe and reflector, and readily and conveniently detached and removed therefrom at any time. Over the globe is placed a shade constructed of thin corrugated metal. The inside being enameled or painted white, or otherwise finished, gives it a good reflecting surface. Its outside may be plain or ornamented in any appropriate manner.

629.—LEONI, S., New North Road, London, "*Improvements in heating and cooking apparatus.*" Patent dated Feb. 19, 1874.

These improvements consist in apparatus heated by means of gas or oil, a condenser being employed in order to separate the aqueous from the gaseous vapour in the products of combustion, and facilitate the escape of the noxious gases. The water of condensation passes from the condenser through a syphon, and the noxious gases through a flue of smaller diameter than usual. In apparatus for cooking by gas, the several processes of roasting, baking, steaming, and water boiling can be carried on simultaneously by the combustion and arrangement of the parts.

641.—HOLLAND, H., Birmingham, "*Improvements in the manufacture of gas for illuminating and heating purposes.*" Patent dated Feb. 19, 1874.

For the purpose of manufacturing gas according to this invention any suitable bituminous or hydrocarbon liquid is used. It is preferred, however, to use shale oil, as being cheapest and very effective; and when the same is not sufficiently liquid to run freely, it is thinned down with a little benzoline or analogous liquid hydrocarbon. The shale oil, when thus ready for use, is vaporized by causing it to flow sparingly into a retort heated to redness, and at the same time a regulated quantity of atmospheric air is introduced into the heated retort. The air and vapour of the oil combine under the influence of the heat to which they are subjected, and pass out of the retort as inflammable gas or vapour, whence it is conducted through suitable condensing apparatus, either to a holder for storage and future use, or direct to burners for immediate combustion. When desired, also, the gas on its way to the holder or burners may be conducted through the ordinary purifying apparatus of a gas-work.

In order to afford a larger heating surface for the vaporization of the oil, and otherwise assist in combining it with the atmosperic air introduced, the retort may be charged with any suitable porous substance, such as lime, chalk, burnt clay, pumicestone, or coke. If charged with lime the same will also have a purifying effect on the gas produced.

A modification of the above method of making the gas is to saturate the porous material with the oil, and charge the heated retort with it, at the same time forcing through the retort a regulated amount of atmospheric air, which will combine with the vaporized oil, the result being the production of an inflammable gas as in the original method.

Another modification is to first charge the air with the oil, or with the vapour of it, by forcing the air through it, and then passing the combined air and vapour through the heated retort. In employing this method it will usually be found that a larger proportion of benzoline or analogous liquid hydrocarbon will have to be added to the shale oil, to fit it to be absorbed or taken up by the passing air.

APPLICATIONS FOR LETTERS PATENT.

3455.—WESTERBY, T. W., New Wortley, and Leeds, Yorks, "Improvements in pressure and vacuum gauges." Oct. 9, 1874.

3459.—HALLSWORTH, S., Armley, near Leeds, and BAILES, R., Woodhouse Carr, Leeds, Yorks, "Improvements in the mode of treating and clarifying sewage or other impure waters." Oct. 9, 1874.

3460.—M'KAY, W., Carnoustie, N.B., "A new or improved apparatus for heating by gas." Oct. 9, 1874.

3464.—PARKES, S. H., Birmingham, Warwick, "Improvements in gas and other lamps." Oct. 9, 1874.

3469.—KÖRTING, E., Manchester, Lancs, "Improvements in the method of and apparatus for revivifying the materials or agents employed for purifying gas used for lighting and heating purposes." Oct. 9, 1874.

3471.—KÖRTING, E., Manchester, Lancs, "Improvements in the mode of and apparatus for compressing and rarefying fluids applicable for forcing, driving, or drawing gas through liquids or other matters, and also for filtering and for other useful purposes." Oct. 9, 1874.

3472.—SCOTT, H. Y. D., Ealing, Middlesex, "Improvements in the manufacture of ammoniacal salts." Oct. 9, 1874.

3487.—FOULIS, W., Glasgow, "Improvements in charging and drawing retorts, and in the machinery or apparatus employed therefor." Oct. 10, 1874.

3489.—HASELTINE, G., Southampton Buildings, London, "Improvements in apparatus for feeding gas-retorts, and for other analogous purposes." A communication. (Complete specification.) Oct. 10, 1874.

3500.—TAPLAY, H., Stafford, "Improvements in the construction of chandeliers, gaseliers, pit-cages, and other similar apparatus." Oct. 12, 1874.

3510.—WALTER, N., Reigate, Surrey, "Improvements in dry closets." Oct. 12, 1874.

3511.—JONES, G. H., Great Russell Street, Bloomsbury, and WHITE, R. G., Edith Grove, West Brompton, London, "An improved method of and apparatus for lighting and extinguishing gas-lamps by galvanic and electro-magnetic influence." Oct. 13, 1874.

3525.—KIRTLEY, J. G., Monkwearmouth, Sunderland, Durham, "An improved filtering apparatus, especially adapted for domestic and ships use." Oct. 14, 1874.

3545.—JOHNSON, R., Bradford, Yorks, "Improvements in machinery for exhausting and propelling air, gas, and other fluids and liquids." Oct. 15, 1874.

3549.—HAMILTON, J., Smethwick, Stafford, "Improvements in direct-acting pumps worked by steam or compressed air." Oct. 15, 1874.

GRANTS OF PROVISIONAL PROTECTION.

3199.—KIDD, J. H., Wrexham, Denbigh, "Improvements in the mode of and in arrangements and apparatus for manufacturing manure from sewage, night-soil, and like matters, and in the preparation and application of certain materials for deodorizing sewage, nightsoil, and like matters." Sept. 19, 1874.

3243.—PEACOCK, J. C., Finsbury Park Road, and BRADLEY, C. W., Circus Place, London, "Improvements in the manufacture of illuminating and heating gas and distributing thereof for use by means of apparatus adapted for said purposes." Sept. 22, 1874.

3330.—BOND, F. T., M.D., Gloucester, "Improvements in the construction of dry and water closets, and of apparatus to be used therein." Sept. 29, 1874.

3340.—FORBES, Rev. G. H., Broughton, Northampton, "Improvements in the manufacture of cement." Sept. 30, 1874.

3345.—WESTWOOD, W. H., WRIGHT, E., and WRIGHT, E. T., Dudley, Worcester, "Improvements in stop or regulating valves for regulating or controlling the passage of liquids and gases through pipes or tubes, and for other like purposes." Sept. 30, 1874.

3346.—ROBINSON, F., Leytonstone, Essex, "An improved mode of and apparatus for the manufacture of gas." Sept. 30, 1874.

3352.—LYNDE, J. H., Sale, Chester, "An improved apparatus for saving water in water-closets, urinals, and other places where a fixed quantity of water is required at each operation." Oct. 1, 1874.

3404.—TROTTER, H., North Shields, Northumberland, "An improved self-lighting and extinguishing apparatus." Oct. 6, 1874.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

3489.—HASELTINE, G., Southampton Buildings, London, "Improvements in apparatus for feeding gas-retorts, and for other analogous purposes." A communication. Oct. 10, 1874.

NOTICES TO PROCEED.

1929.—SCHANZER, L. I. L., Odessa, Russia, "A new or improved instrument or apparatus for drilling and tapping or screwing mains under pressure, and attaching pipes, cocks, or connexions thereto." June 3, 1874.

2060.—PERRETT, E., Great George Street, Westminster, "Improvements in apparatus for filtering liquids." June 13, 1874.

2061.—PERRETT, E., Great George Street, Westminster, "Improvements in the arrangement of bag-filters" June 13, 1874.

2093.—FISHER, J. I., Harworth, Nottingham, "Improvements in dry closets." June 16, 1874.

2270.—CLARK, A. M., Chancery Lane, London, "Improvements in the manufacture of gas and fuel." A communication. June 30, 1874.

3307.—REDWOOD, T. B., Fairlawn, Finchley, Middlesex, "Improvements in the manufacture of gas for burning." Sept. 26, 1874.

3319.—BESSEMER, H., Queen Street Place, Cannon Street, London, "Improvements in apparatus for collecting and storing water for the supply of towns, villages, dwelling-houses, factories, and chemical or other works, and for agricultural purposes." Sept. 28, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1390.—CRAWFORD, A., Glasgow, "Improvements in water-closets, and in waste-preventing water-supply apparatus." April 22, 1874.

1391.—FORBES, Rev. G. H., Broughton, Northampton, "Improvements in the utilization of the foul or refuse lime of gas-works." April 22, 1874.

1430.—THOMSON, W., Glasgow, "A new or improved tube-expander." April 24, 1874.

2495.—NEWTON, W. E., Chancery Lane, London, "Improvements in the manufacture of inflammable gas for illuminating and other purposes, and in the apparatus to be used therein." A communication. July 16, 1874.

2526.—STRATEN, E. V., Antwerp, Belgium, "Improvements in apparatus for the combustion of air and gas for heating purposes." July 18, 1874.

2815.—SMITH, W. H., Edgbaston, Birmingham, Warwick, "Improvements in treating metals and their alloys by subjecting them to the action of liquids, gases, vapours, and in apparatus employed therein, and for the manufacture of gas for illuminating and heating purposes." Aug. 15, 1874.

2824.—JOHNSON, S. H., F.C.S., Stratford, Essex, "Improvements in cocks or valves." Aug. 15, 1874.

2878.—ARONSON, J. N., Portland Place, London, "Improvements in lamps or lighting apparatus." Aug. 21, 1874.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2470.—OWEN, J., "Improvements in the construction of high-pressure filters." Sept. 20, 1871.

2511.—VERITY, J., "Improvements in the construction of chimneys for gas-burners, and oil and other lamps, and in reflectors and protectors for the same." Sept. 23, 1871.
2567.—DE CHASTELAIN, C., "Improvements in the mode of and apparatus for intercepting, collecting, and filtering fœcal and sewage or drainage matters." Sept. 29, 1871.
2599.—LAKE, W. R., "Improvements in the manufacture of inflammable gases, and in apparatus employed therefor." Oct. 2, 1871.
2613.—JOHNSON, J. H., "Improvements in water-meters." Oct. 3, 1871.
2655.—STILL, A. H., and LANE, D., "Improvements in the manufacture of illuminating gas." Oct. 6, 1871.
2659.—BURROW, J., "Improvements in treating sewage and other matters." Oct. 7, 1871.
2662.—KROMSCHROEDER, J. F. G., "Improvements in apparatus for generating inflammable gas or vapour for heating and lighting purposes." Oct. 7, 1871.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2686.—FORBES, H., "Improvements in the construction of rotary pumps." Sept. 24, 1867.

Notes and Queries.

W. D. asks: "Will some of the readers of the JOURNAL inform me what size purifiers ought to be to pass 170,000 cubic feet in the 24 hours?"

Giroud's Rheometer.—Civis Romanus writes: "Allow me to inform your correspondent, Mr. H. E. Jones, that Giroud's rheometers are to be got: Paris, 27, Rue des Petits Hôtels. These governors are patented in Great Britain, but I am not aware that M. Giroud has appointed an agent for England."

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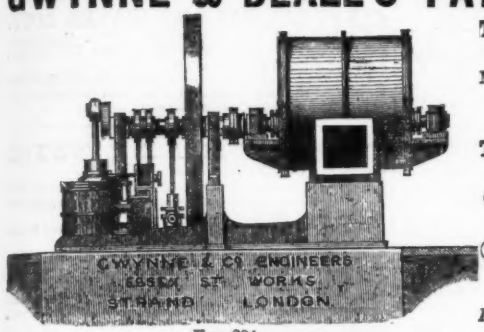

FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.
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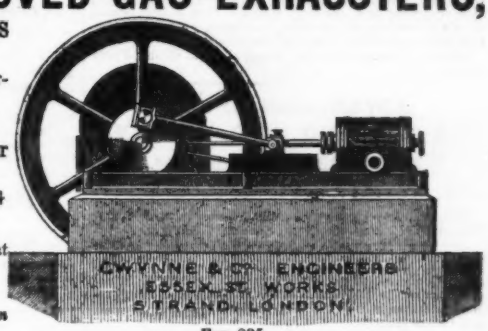

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the most perfect system of action yet discovered. Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 62,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the excellence of the article produced, and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

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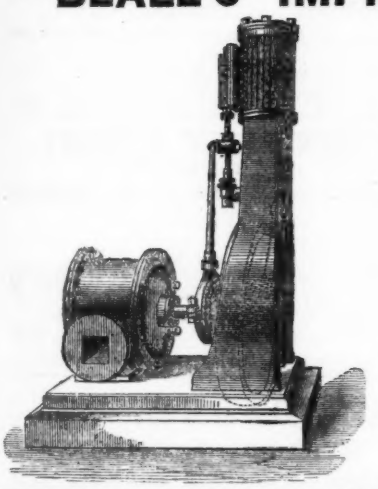

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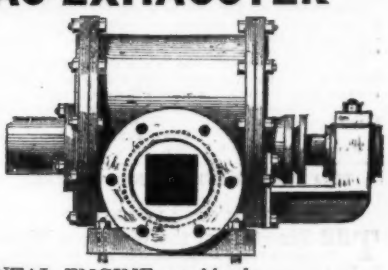

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Tar about . . . . 20,000 gallons.
Liquor about . . . 20,000 gallons.

All expense of removal to be paid by the Contractor.

For further particulars, apply to Mr. T. H. Martin, the Company's Engineer, Gas-Works, Barnet.

Tenders to be sent under seal, endorsed "Tender for Tar and Liquor," to the Offices of the Company, No. 60, Cornhill, London, on or before the 29th inst.

By order of the Board.

60, Cornhill, London, Oct. 16, 1874.

GAS TAR AND AMMONIACAL LIQUOR FOR SALE.

THE Directors of the Hartlepool Gas and Water Company are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR to be produced at their works, West Hartlepool, for One, Two, or Three years, from the 1st of December next.

The quantity of Tar will be about 60,000 gallons and Liquor about 90,000 gallons per annum, and will be delivered into Contractor's tanks on the Railway Company's siding at the above works.

No person need tender who is not prepared to remove both Tar and Liquor in tank trucks, and no tender will be received after Tuesday, the 10th of November next.

The Directors do not bind themselves to accept the highest or any tender.

By order,

Thos. Trewhitt, Secretary.

West Hartlepool, Oct. 9, 1874.

WREXHAM WATER-WORKS COMPANY.

CONTRACT FOR RESERVOIR.

THE Directors of the Wrexham Water- Works Company are prepared to receive TENDERS for the construction of an IMPOUNDING RESERVOIR, capable of containing about 40 million gallons, and situated in the township of Moreton Above, in the parish of Ruabon.

Plans and specifications, together with a schedule of quantities, can be seen on and after the 1st of October, at the Company's Offices, 5, Charles Street, Wrexham.

Copies of the specification, and schedule of quantities, can be obtained at the above address, at a charge of one guinea per set.

Sealed tenders, in the form attached to the specification, endorsed "Tender for Impounding Reservoir," to be forwarded to me on or before the 31st day of October next.

The Directors do not bind themselves to accept the lowest or any tender.

Frederick Storr, Secretary.

5, Charles Street, Wrexham, Sept. 21, 1874.

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By many important gas and railway companies they are used as being the best obtainable for general purposes, and have supplanted enormously costly burners, which have been made to give good results in the testing-room, but which fail of their effect when brought to the test of general use.

Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner to the City of Glasgow, in a lecture on the "Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow in March last, says: "These are the best Burners obtainable at moderate cost," and, after mentioning several other "good" Burners, which ranged in price up to thirty times the price of ours, he continues, "but these are all costly, and their performance is no better than that of Bray's Burners."

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NOTICE is hereby given that an EXTRAORDINARY GENERAL MEETING of the Company will be held at 10, Coleman Street, London, on THURSDAY, the 29th of October inst., for the purpose of altering Clause 21 in the Company's Articles of Association, so that the Ordinary General Meetings of the Company may, in future, be held in the months of May and November, instead of April and October, and for altering Clause 28 in the said Articles of Association, so that the legal quorum of shareholders constituting a meeting may be eight instead of fifteen members.

And Notice is also hereby given that the Ordinary General Meeting of the Company will be held at 10, Coleman Street, immediately after the conclusion of the business at the aforesaid Extraordinary Meeting, but *pro formâ* only, for adjournment to a future day (of which due notice will be given) as the half-yearly accounts and balance-sheet to June 30, 1874, cannot be submitted to this meeting, the statements not having been received from Bahia.

The chair to be taken at Three o'clock precisely.

By order of the Board,

Alfred J. Head, Secretary.

10, Coleman Street, City, Oct. 15, 1874.

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GAS COMPANIES ACCOUNTS.

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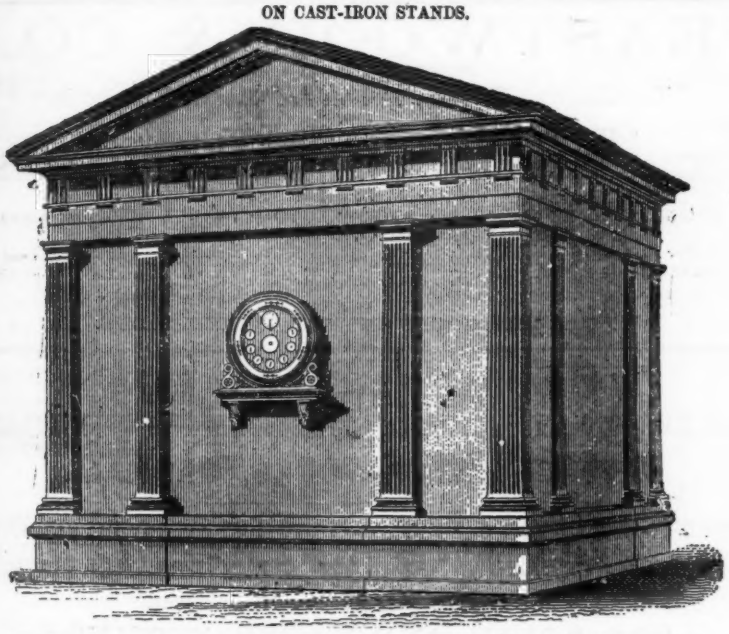

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4th, Never a choked Ascension Pipe.
5th, Saves Fuel and Wear and Tear.
6th, Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
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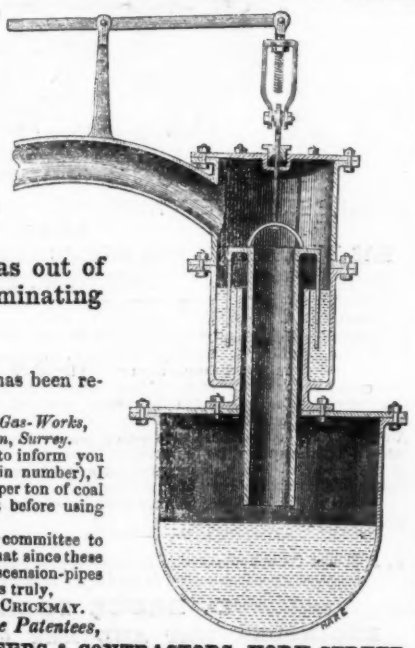

The following (among other letters) has been received:—

Engineer's Office, Metropolitan District Asylum Gas-Works, Caterham, Surrey.

Messrs. Chandler and Sons.

Dear Sirs,—In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

I should add that I intend recommending the committee to adopt them throughout these works. I also find that since these Dip-Pipes have been fitted, I have had no ascension-pipes choked, which was before a great nuisance.—Yours truly,

Jan. 15, 1874. WM. CRICKMAY.

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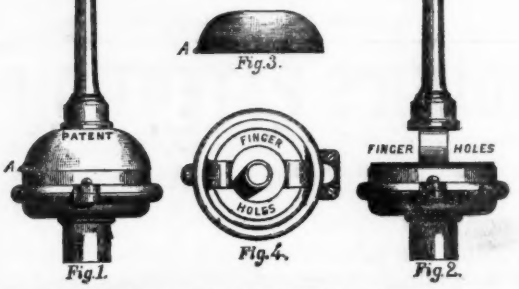

Fig.3. Fig.1. Fig.4. Fig.2.

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PATENTEES OF
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"A few years ago, a simple form of Gas Regulator for Street Lamps was introduced, I do not know by whom, and various forms of it, and improvements on it, have been made by many practical gas engineers. Of all the modifications of the instrument, the best in my opinion is that of Mr. D. Bruce Peebles, of Edinburgh; in fact, his Lamp Regulators are so superior that they are likely to supplant all others. Already about 9000 of these have been applied to the street-lamps in Glasgow, and I understand it is the intention of the authorities to introduce them all over the town. The saving thereby effected I calculate to be about £6000 per annum, without any diminution of light. One of the great advantages of Mr. Peebles's apparatus over all others is that it can be regulated while the gas is burning."
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Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

Note.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

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